CHEMICAL LIBRARY
MAR -5 1920
UNIV. OF MICH.

GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

Vol. CXLIX. No. 2961.] LONDON, FEBRUARY 10, 1920. [72nd Year. Price 8d.

OXIDE OF IRON
SPENT OXIDE

Gas Purification and Chemical Co., Ltd.
PALMERSTON HOUSE, LONDON, E.C. 2.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

PUMPING ENGINES
All Types for ACID, &c.
CAST-IRON OR STEEL TANKS
Any Capacity.
CHEMICAL PLANT.
Roofs and Girders. Structural Work.
Air and Gas Compressors.
MIXERS.
TAR STILLS AND CONDENSERS.
SULPHATE OF AMMONIA PLANT
W. NEILL & SON, Ld.
Engineers, Iron & Brass Founders,
ST. HELENS JUNCTION.
Telegrams: 'Neill, St. Helens.' Telephone No. 20.

PURIFYING MATERIAL
"Brownox-de-Luxe."
Unqualified Satisfaction given where used.
SPENT OXIDE PURCHASED
J. BROWN & CO., Ltd.
Savile Town, DEWSBURY.

TORBAY
JOINT STOPPING
FREE FROM LEAD.
The TORBAY PAINT CO.,
26/28, Billiter St., LONDON, E.C. 3.
39/41, Old Hall St., LIVERPOOL.

"BLUEBELL"
SILICA RETORTS
(95% SILICA)
John G. Stein & Co., Ltd.,
Castlecary, SCOTLAND.

Makers of
GASHOLDERS,
TANKS (C.I. or Steel),
PURIFIERS,
WASHERS,
ROOFS,
&c.
ASHMORE, BENSON, PEASE & CO., LTD.
STOCKTON-ON-TEES.
Complete GAS WORKS
London Office:
39, Victoria Street, Westminster, S.W.
Telegrams: "GASHOLDER."

W. & B. COWAN
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON. MANCHESTER. EDINBURGH. GLASGOW.
SYDNEY. MELBOURNE. BRISBANE. WELLINGTON, N.Z.
(See Advertisement on page III. of Wrapper.)

JAMES McKELVIE & CO.
Coal Owners,
Gas and Steam Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

GEORGE GLOVER & CO., LTD.,
DRY GAS METER MANUFACTURERS.
Agents for the Patent "M & M" SELF-LOCKING SLOT-METER PADLOCK.

The STRENGTH and SECURITY of the **"M & M"** Lock depend not upon its EXTERNAL SHAPE, which has been imitated in various quarters, but upon the SPECIAL CONSTRUCTION of its INTERNAL MECHANISM.
The special mechanism, consisting of a sliding bolt fitted with TWO STUMPS and DOUBLE-ACTION LEVERS, is FULLY PATENTED.

See that each lock is stamped **M & M,** *and beware of inferior imitations.*

LONDON:
ROYAL AVENUE, CHELSEA, S.W. 3
TELEPHONE: 1140 Kensington.
WIRE: "Dry Meters, London."

LEEDS:
9, DEWSBURY ROAD.
TELEPHONE: No. 2934.
WIRE: "Meters, Leeds."

MANCHESTER:
GAYTHORN METER WORKS, EASTON STREET.
TELEPHONE: No. 6898 City.
WIRE: "Slot, Manchester."

"FERRODOR" ELASTIC PAINT
For ALL Gas Plant and Steel Structures.
Does not blister or "chalk" off.
GRIFFITHS BROS. & CO. (LONDON), LTD.
BERMONDSEY, LONDON, S.E. 16.

The HORSELEY BRIDGE & ENGINEERING Co., LTD.,

TIPTON, STAFFORDSHIRE.

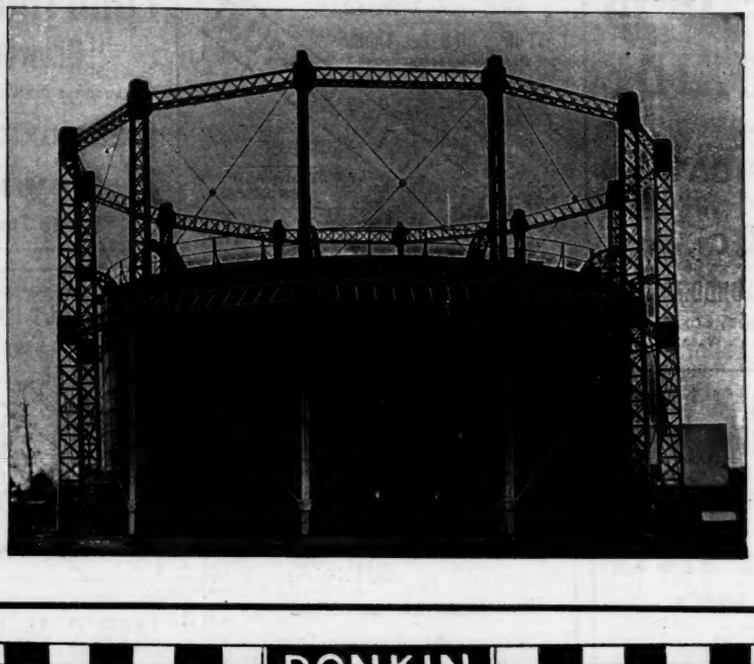
MAKERS — OF — **GASHOLDERS & GAS PLANT.**

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES, PIPES, LAMP-PILLARS, RETORT-FITTINGS, CAST-IRON AND STEEL TANKS, PRESSED STEEL FLOORING, Etc.

Works & Head Office:
TIPTON,
STAFFORDSHIRE.

London Office:
11. VICTORIA STREET,
WESTMINSTER.

Telegraphic Addresses:
"HORSELEY, TIPTON."
"GALILEO, LONDON."



Also all Kinds of
STRUCTURAL IRON AND
STEEL WORK.
BRIDGES,
ROOFS,
PIERS, Etc.

B DONKIN D

RATEAU TURBO GAS EXHAUSTERS

ALSO FOR

PRESSURE RAISING & COMPRESSING.

Manufacturers under Licence from Professor Rateau.

WE HAVE SUPPLIED AND HAVE ON ORDER—

ONE HUNDRED & SIX MACHINES.

Total Capacity: **46,938,000** cubic feet per hour.

MAKERS ALSO OF

VALVES of all Sizes & Types (Air & Gas) and for High or Low Pressures. **DISTRICT & SERVICE GOVERNORS.**

HIGH PRESSURE GAS PLANTS.

GAS EXHAUSTING PLANTS TO SUIT ALL CONDITIONS.

VALVES for COKE OVENS a Specialty. GLAND PLUG COCKS.

THE BRYAN DONKIN CO., LTD.,

Engineers and Ironfounders,

Head Office and Works, CHESTERFIELD.

London Office: 3, VICTORIA STREET, WESTMINSTER, S.W. 1.

Chesterfield Telephone No. 84.
London Telephone No. 5358 Victoria.

Chesterfield Telegrams, "Donkin Chesterfield."
London Telegrams, "Donkin Vic. London."

B CHESTERFIELD D

CONTENTS.

EDITORIAL NOTES.

Financial Restoration—Help of Gas Proprietors and Gas Workers 289
Fresh Bonds Suggested for the Industry . . 290
Altered Features of the South Metropolitan Accounts 291
Correcting Electrical Errors. 292
Combinations of Gas Consumers—A Stand for the Liberty of Non-Unionists. 292
Daylight Saving Permanent in France—Nationalization 293

Institution of Gas Engineers—Council Meeting 293
National Gas Council—Midland Board . . 293
Note on the Thermal Efficiencies of Production, Distribution, and Use of Gas and Electricity. By Sir Dugald Clerk, K.B.E. 294
Electricity Supply Memoranda 296
Commercial Gas Company—Annual Report and Accounts 297
The Ideal Home Exhibition 298
Oxide Purification: Examination of Mixtures of Ferrous and Ferric Sulphides and Free Sulphur. By G. Weyman, M.Sc., A.I.C. . 301
Personal 301
Cleaning Gas by Electrical Precipitation . . 301
Coke-Oven Gas for Sheffield — Adjourned Discussion on Mr. Laverick's Paper . . 302
American Calorimeter Installation. . . . 302
Progress in Chemical Industry in 1919. . . 303
Chemical Engineering in Gas Works . . . 304
Good Lighting as an Aid to Safety. . . . 304
Midland Junior Gas Association—Address by Mr. R. J. Rogers on Gas Sales Problems. 305
Woolwich Arsenal Gas Factory—Visit by the London and Southern District Junior Gas Association 308
Refractories for Coke-Ovens. By W. J. Rees, F.I.C. 309
The Uses of Gas and Electricity 312
A New Characteristic for Coal 313
Colour Matching by Artificial Light . . . 313

REGISTER OF PATENTS.

Production of Ammonium Salts—Curphey, W. S. 313
Attaching Brackets to Gas-Pipes—Spensers, Ltd., and Smith, H. E. 314
Cement for Fire-Clay Retorts—M'Minn, S. A. 314
Applications for Patents 327

MISCELLANEOUS NEWS.

Gas Light and Coke Company's Meeting . . 315
Brighton and Hove Gas Company's Bill Approved by the Proprietors 318
Brentford Gas Company 319
Quality of Gas—The British Association Fuel Economy Committee and the Board of Trade 320
London County Council and Gas Affairs—Gas-Meter Testing—Temporary Increase of Charges 320
Wandsworth Gas Company's Bill—The Chairman Explains the Proposals . . . 321
Gas Supply in Lanarkshire 321
Presentation to Mr. J. W. Broadhead . . . 321
Nottingham Gas Affairs 321
Current Sales of Gas Products 321
Midland Gas Undertakings and Coal Supplies 324
Disposal of Coke in Leeds 324
Shipley Gas Supply 325
Water Heating Lectures in Dublin. . . . 326
Stock Market Report 328

PARAGRAPHS.

Temporary Increase of Charges Act—Coke Dust as Boiler Fuel. 312
Supply of Gas to Stockton 314
Gas-Works Results at Darlington 320
Poor Coal at Dewsbury—Report of the Scarborough Gas Company—Newport (Mon.) Gas Company 322
South Metropolitan Gas Bill—Maximum Increase beyond the Statutory Maximum Charge — British Sulphate of Ammonia Federation — Suggested Gas Consumers' Association—Grantham Gas Company—Tottenham District Light, Heat, and Power Company—Stockton and the Coal Control Department 323
Silsden Gas-Works Extensions—Falling Off in Mond Gas Company's Output—Doncaster Gas Undertaking—Decreased Sale at Pudsey 324
Charge for Gas at Broadstairs—The North Middlesex Gas-Works Strike — Fletcher, Russell, & Co. and Radiation, Ltd.—A Restricted Supply at Brierley Hill—Price of Street Lighting at Cannock—Improved Coal Position at Wolverhampton—Redcar Gas-Works Purchase—Quality of Dublin Gas 325
Kilkenny Gas Prices—Cost of Prepayment Supplies—Leeds and Coke-Oven Gas—Sunderland Gas Company's Profits—The Coal Rebate and Temporary Increase of Charges Act—Strike Threat in South Wales 326
Dublin Gas Leakage Fatality—Lighting at Sligo 327
Denton's Gas Supply—Dudley and Gas-Works Municipalization — Vertical Retorts for Neath—Salford Gas Inquiry 328

"JOURNAL" OFFICE TELEPHONE.

The "Journal" Office Telephone Number is "6857 Holborn."

HUMPHREYS & GLASGOW, LTD.,

AND

THE UNITED GAS IMPROVEMENT CO., U.S.A.

WATER GAS

BLUE *AND* CARBURETTED.

Humphreys & Glasgow, Ltd. 368,400,000 Cubic Feet Daily.

The U.G.I.Co., U.S.A. - - 777,900,000 Cubic Feet Daily.

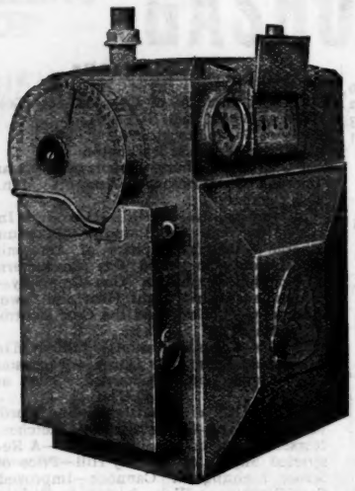
OVER ONE THOUSAND MILLIONS CUBIC FEET DAILY.

38, VICTORIA STREET, LONDON, S.W.

Bureau de Bruxelles: 82, Rue du Trône, Ixelles.

We are exhibiting at the Ideal Home Exhibition, Olympia, Feb. 4th to 21th. Stand No. 15.

We are exhibiting at the British Industries Fair, Birmingham, Feb. 23rd to Mar. 5th. Stands Nos. 74/75.



The "T.G." Auto Meter *without* seal on Price Changer.

"T.G." POINTS.

No. 3.

The prepayment attachment of the "TG." Meter. is simple, substantial, and positive in action, and is designed on sound mechanical lines. The driving mechanism of the attachment and the meter-registering mechanism are operated separately. The ingenious arrangement which permits of the independent working of the registering mechanism does away with the use of couplings—weak points—and also ensures the gas being registered in the event of attempted fraud on the part of the consumer. The "T.G." Meter is the safe meter.

THOMAS GLOVER & CO., LTD.

(Original Makers—Established Three-Quarters of a Century),

GOTHIC WORKS, ANGEL ROAD, EDMONTON, LONDON, N. 18.

Telephone: 41 Tottenham (3 lines). Telegrams: "Gothic 'Phone, London."

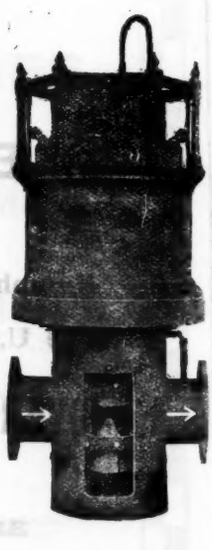
London Show-Rooms: 25, PRINCES STREET, OXFORD CIRCUS, W. 1.

Gothic Works, King Edward Road, BIRMINGHAM; 18, Severn Street, Deansgate, MANCHESTER; Gothic Ironworks, FALKIRK; 82, Gordon Street, GLASGOW; 97, Millfield, BELFAST; 35, Earl Street, BRISTOL; and 333, Queen Street, MELBOURNE.

PARKINSON'S

Equilibrium

Double Cone Governors.



Weights or Water Pressure.

Prices and Full Particulars on application.

W. PARKINSON & CO.,

(INCORPORATED IN PARKINSON AND W. & B. COWAN, LTD.)

COTTAGE LANE, CITY ROAD, LONDON.	BELL BARN ROAD, BIRMINGHAM.	HILL STREET, BELFAST.
Telegrams: "INDEX, LONDON." *Telephone Nos.:* 7570 City.	"GASMETERS, B'HAM." 2245 Midland, B'ham.	"PREPAYMENT, BELFAST." 3374 Belfast.

GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

VOL. CXLIX., No. 2961.] TUESDAY, FEBRUARY 10, 1920. [72ND YEAR.

EDITORIAL NOTES.

Financial Restoration—Help of Gas Proprietors and Gas Workers.

EXPECTATION was fulfilled at the meeting of the Gas Light and Coke Company on Friday. The speech of the Governor (Mr. D. Milne Watson) was composed largely of materials which quantitatively no other gas company in the world can produce; and, in the other part, there were messages and appeals to all directly concerned, through work or investment, in the gas industry to do their individual utmost in helping to pull it through the crisis in which it has been plunged owing to an accumulation of circumstances of legislative and external origin. There was hope and there was warning in the address. The hope should be an incentive; and both the hope and the difficulties should stimulate all involved in them to the best possible action within the sphere of their opportunities. "Although the outlook is full of "difficulty," said the Governor, in the closing lines of his speech, "yet so far as business is concerned it is full of pro- "mise, both with regard to our main product (gas) and our "residuals; and if only we can obtain from Parliament the "much hoped-for relief from our financial troubles, the pro- "spect for the future may be said to be bright." There we have in few lines the essence of the whole position—difficulty, promise, and need. It is the need which claims immediate earnest consideration and active co-operation.

The extraordinary increase of business of the Company during the past year—which increase represented sufficient gas to supply the whole of the Newcastle-upon-Tyne Gas Company's area for a twelvemonth—does not yield a penny in direct advantage to the proprietors of the Company, who are at the moment for the dividend lying between £1 12s. and £3 p.ct. the debtors to an exiguous show of benevolence on the part of the last Parliament. Nor have the proprietors had the slightest share in the mountains of expenditure – due in considerable part to the higher remuneration of miners, gas workers, and labour in other industries from which the gas industry draws its supplies. All the millions of money invested in the gas industry, which has created a source of current wealth for labour, is realizing but 3 p.ct., and some of it less than that. Yet the capital has been provided not by speculators, but by investors; not by people who have been born with silver spoons in their mouths, or people who live by their wits, but by people who have worked, saved, and invested—many of them for old age—and are now pinched in a manner which is not the experience of any gas worker or miner. These people are victims of a gross injustice. They have not, to present their case or to urge their claims, a union or any other organization which they have themselves promoted; and therefore they have to rely for concerted effort upon the National Gas Council. Looked at so, the Council will appreciate their responsibility not only to what we call in its collective state the industry, but to individuals who are being deprived of their due in a way that is nothing less than scandalous, and a reproach to the Legislature. "Something more must be "done," said the Governor; and from many parts of a meeting much more extensively attended than usual came the endorsing "Hear, hear." Whatever is done must be aided by the proprietors themselves. Every man has influence somewhere; and it should be exercised. The neighbour and the friend are ignorant of this deviation from common right that the sliding-scale has produced, and of the neglect of Parliament in, when the opportunity arose, re-establishing right. These are points of which neighbours and friends need telling. Public knowledge will create public opinion; and public opinion should be highly invaluable in this matter. There has to be revision now. A Bill is promised; but the Governor says (and the voice is that of the President of the National Gas Council) that there is not much hope of the Bill being introduced before Easter. With so much work awaiting Parliament on re-assembling, this cannot be helped; and we would sooner have a little delay in order to keep clear of the crush and get into a more open field, for the industry knows the strength of its case, and fears no examination of the most exacting character. The personal influence of proprietors not only of the Gas Light and Coke Company, but of those interested in all other gas companies, should also be brought to bear upon members of Parliament in every constituency. The Governor made a special call for this. It is a question of educating members of Parliament as to the position, so that they may vote honestly. No member of Parliament who understands the situation can say that what has been done represents justice; no intelligent member of Parliament can say that any industry can live, much less flourish and expand, on such terms as those that now obtain in the industry. There is plenty that proprietors can do to assist in the work of reclaiming as far as possible the financial status of the industry.

If unfortunately there is not revision, what is before the industry on the expiration of the Temporary Increase of Charges Act? The proprietors of the Gas Light and Coke Company would receive only £1 12s. p.ct. dividend at the present price of gas; proprietors of some other companies would get less; and those of others would have nothing at all. The breaking-up process would set in. And then what of the army of workers in the industry? The interests of the proprietors and of the workers (quite distinct from any definite scheme of co-partnership) are co-related in a manner which has been inadequately distinguished. Industry cannot live without capital; it cannot expand without fresh capital. The industry must be made sufficiently attractive to draw money savings into it. How is this to be done? By giving to existing capital a fair—not an exorbitant—dividend. Only by so doing will confidence in it be restored. Failing this, gas workers may look not for an expansion of the industry, but an inability on its part to continue. Their very livelihood and the extension of employment therefore depend upon justice being done to gas capital. So between the two—gas capital and gas worker—the closest alliance should obtain. It is hard to make some sections of labour see this; but the more intelligent and far-seeing have no difficulty in realizing that the ill-requital of, or unjust dealing with, capital means an undermining of the foundation upon which labour stands. As to the gas consumer, capital is part of the system which renders him service, and so is labour. Just as he has to pay a fair price—more than fair in many cases to-day—for labour, so he must pay a fair price for capital. It would require very little addition to the price of gas to pay a reasonable dividend. If this little addition is not paid, then forsooth the time will come when the gas industry will not be able to meet public demand. The public will suffer, so will the gas worker, and so will those who have invested in gas stocks, believing in the security which parliamentary authorization and control were supposed to afford them. We hope their belief will soon be again justified; and that everybody who can contribute anything to the bringing about quickly of the financial rehabilitation of the industry will do so.

This question, to our mind, is the matter of greatest general importance in the speech of the Governor. Those who like to read of exceptional conditions and big figures

will be satisfied in other parts of the address. There are several subjects, too, upon which the views of the Governor will be sought. There is the matter of domestic gas account allowance from the coal rebate of 10s. In the case of the Gas Light and Coke Company, with their make of coal gas per ton and their average percentage of water gas, the allowance will be 7½d. per 1000 c.ft. in the current quarter. The remarks on repairs and maintenance will be noted with interest; and, in connection with capital expenditure, it will be seen that mention is made of six new colliers being under construction for the Company. Even with the old boats, the running expenses, including all charges, only amounted last half year to 6s. 6d. per ton of coal carried; while the ships that had to be chartered cost 12s. 9d. for large and 17s. for small boats per ton carried. This is a monstrous profit. It will also be seen that the last increase of 5s. upon wages will mean an addition of approximately £200,000 a year to the wages bill, and will make its total not far short of 3 millions a year. These are typical points of interest in the Governor's speech, which is assured a very wide reading from the unique position he occupies in the movements in the gas industry to-day.

Fresh Bonds Suggested for the Industry.

THE gas industry has been in existence some years over a century; and gas supply is found in all civilized places throughout the world. The British gas industry has developed despite certain statutory restrictions, but not in the measure it might have done had it only been free of them. Now that it is proposed, by a competent body such as the Board of Fuel Research, that more liberty in development and service should be given to the industry, under reasonable conditions, there comes along an outside body (known as the Fuel Economy Committee of the British Association) urging that fresh bonds should be placed upon the industry—bonds that have not been applied before throughout the century and more of work, and certain of which bonds no other country has thought fit to apply. Their application would spell ruin to the attaining of the highest economy and efficiency in the gas industry, and would prevent it doing its best part in assisting in the conservation of coal, and in providing for the masses of the people and the industries as cheap gaseous fuel as is possible in the economic circumstances of the day. Of these proposed new bonds, we first heard something in the Cantor Lectures delivered last spring by Prof. Bone, who is Chairman of the British Association Fuel Economy Committee. Prof. Bone was once associated with the Board of Fuel Research in an advisory capacity; but the association was severed. The next step was the revival of the Fuel Economy Committee of the British Association; and at the last British Association meeting, at Bournemouth, the Committee presented a report in the course of which it subscribed to certain of the recommendations in the Fuel Research Board's report on gas standards, but proposed that some unprecedented restrictions should be placed on the gas industry—restrictions for which history and experience show no justification whatever. Something was heard of the Fuel Economy Committee again at the subsequent meeting of the Iron and Steel Institute; and now Prof. Bone, Sir Robert Hadfield, Mr. W. H. Patchell, and Mr. H. James Yates have, in the name of the Committee, interviewed the President of the Board of Trade, and have urged that in the forthcoming gas legislation the fresh shackles advocated by them should be forged about the industry. And this after the Board of Fuel Research, the gas industry, the London County Council, and other important authorities have arrived at an agreement over their differences, and are fully satisfied. The interference of the Fuel Economy Committee at this late stage is anything but complimentary to Sir George Beilby and those who have been working with him.

The suggested fresh restrictions are in three important respects of purely chemical origin. Prof. Bone was the only chemist in the deputation. Sir Robert Hadfield is a Director of the Sheffield Gas Company, which Company was a sort of storm-centre in the matter of gas quality during part of the war period; and it would be interesting to know what the technical men of the Company think of certain of the restrictions that Prof. Bone, as Chairman of the Committee, proposed should be applied to gas undertakings. Mr. Patchell is a Consulting Electrical Engineer; and we have never heard of him before as an authority on the physical and chemical properties of gas. Mr. Yates was the remaining member of the deputation. We can only say that we, as many others will, regret exceedingly to see him in this particular galley. Cheap gas for heating purposes is what he of all people should desire. His place is on the side of the gas-supply industry. There is not at hand a full report of the proceedings at the interview; but we are informed that the summarized report that has appeared in London and Provincial papers, and is reproduced in our news columns, was sent out by the Board of Trade. So it is authoritative.

The amendments suggested by Prof. Bone and his associates of certain of the final recommendations of the Board of Fuel Research have reference to matters more or less of degree; and these we will leave aside for the moment. The others are that gas undertakings should be compelled to pay great attention to the removal from gas of the "highly "poisonous cyanogen compounds;" that as methane has an effect in reducing the explosive range of hydrogen and carbon monoxide, a minimum of 20 p.ct. of methane should be imposed; and as carbon monoxide is also poisonous, it should have a maximum content of 20 p.ct. placed upon it. Methane and carbon monoxide have been constituents of town gas supply for over a hundred years, and in every country of the world. And although there has been more than a hundred years' operation of the industry, and in spite of the fact that there are in this country scientists other than Prof. Bone, no limitations in these respects have ever been imposed, notwithstanding, as Prof. Bone himself says, that scientific research into these matters has extended for forty years. Methane in gas supply over many years has been a decreasing quantity, and the percentage quantity of carbon monoxide has risen. But where are data to show that explosions or poisoning by gas have increased?

In the name of commonsense, let us look at these questions in a practical way, and not put up a bar against progress because someone has a fad he has been fostering, and has secured a little following. There are but few who want to make this country a laughing-stock of the whole world's scientific and technical gas men; there are many who do not in respect of gas supply want this country left behind other countries through a whim. It would be just as senseless as the recommendations of the Fuel Economy Committee for the Board of Trade to propose fresh regulations regarding electricity supply. The roll is a considerable one of deaths due to electricity supply at ordinary voltages. We suppose Mr. Patchell did not make a point of this in the presence of Sir Auckland Geddes, any more than could Professor Bone that the proportion of accidents due to gas supply has increased with the percentage of carbon monoxide, or explosions with the reduction of the percentage of methane. Glance over at America. The official figures for 1916 published by the National Board of Fire Underwriters in the United States, show that the aggregate loss caused by fires traced as originated by electricity was represented by over £4,000,000, and by gas as only £450,000, of which more than one-half was confined to States in which natural gas is extensively used.

Then as to carbon monoxide. The suggestion is that it shall be restricted to 20 p.ct. This was recommended by the Home Office Committee of twenty years ago; and it has never been acted upon. Is the experience since to be rejected as worthless? Can Prof. Bone advance anything to show that, with the increasing use of water gas, the number of deaths in this country through the change has been enlarged per annum, per unit of consumption, or any other basis that he chooses to take? Can he say that during the war time the experience in this regard varied adversely from that of pre-war years? If he cannot, then there is his answer. Look back at the Board of Trade returns relating to gas undertakings. Sir Auckland Geddes will find that in 1899, when the Home Office Committee made their recommendations, the consumption of gas from statutory concerns in this country was 135,721,697,000 c.ft. In the last official compilation for 1914 in the case of companies and for 1914-15 in the case of local authorities, the consumption of gas from statutory concerns had advanced to 210,907,376,000 c.ft.—an increase of 75,185,679,000 c.ft., or 55·4 p.ct. The number of customers of the statutory undertakings in the year 1899 was 3,485,557; and in the year 1914-15, 7,298,007—showing an increase of 3,812,450, or 109 p.ct. This increase is largely due to prepayment consumers—not entirely, but very largely. Notwithstanding this enormous advance in the output of gas during the last twenty years, notwithstanding the considerable increase

in the extent of the area of population covered by this consumption, notwithstanding that these are the years of the growth of water-gas manufacture, where is the evidence proving that the use of this gas has caused any increase in mortality?

Such matters as these must be looked at by our legislators as by others from the practical point of view, and be tested by experience. To turn to the United States again. There are undertakings there supplying only water gas undiluted with coal gas. In nearly all cases, the percentages supplied are much greater than in this country—important cities showing percentages running up to 86·6. In 1917, the sales of gas in the urban areas of the United States amounted to 342,151,129,000 c.ft. Of this quantity 153,457,318,000 c.ft. were water gas, or 45 p.ct. of the total. There is no restriction there on carbon monoxide, nor a minimum imposed on methane. We are working for fuel economy now; not for fuel waste. And the country's experience supplies solid evidence that public safety has not in any way suffered in consequence of the changes that have been brought about. Dr. Bunte, in Germany, and Prof. Strache, in Vienna, are fully in accord with the use of water gas. If the chemical proposals of the Fuel Economy Committee were applied to the gas industry, a member of Prof. Bone's profession would be required in every little gas-works. We repeat that this is a practical age when things must have applied to them the tests of experience, and not only those of the laboratory.

Apart from this, Prof. Bone told the President that his Committee were in favour of an amendment in the Board of Fuel Research report by the substitution of the words "ascertained net calorific value" in lieu of the words "declared gross value." Parliament has already decided that the gas industry is entitled to "gross" value. This is a matter to which brief reference was made last week in the "JOURNAL," in an article on p. 236. The "declared" value will be the minimum; and recording calorimeters will "ascertain" that this declared value is being adhered to. Then Mr. Yates told the President that, in the view of the Committee, the minimum number of B.Th.U. should be not less than 450 B.Th.U. "net." Perhaps Mr. Yates will tell us why. He is reported to have given one very lame reason. If, he said, gas undertakings supplied gas of lower heating "efficiency," a large part of the existing gas appliances would become useless. Have the manufacturers then lost faith in their own ingenuity? Air-regulating devices and suitable burners are not beyond the realm of possibility. They are actually here. Existing appliances, too, will not last for ever. Appliances, where necessary, must be made to suit progress and economy, and not progress and economy be held back to suit appliances. If Mr. Yates considers his own position as a manufacturer of gas appliances, he will see how illogical is the reason he gave. Would he put a limit in his own works to progress and economy, if some part of the plant was unsuitable to their attainment? We think not; and we can see him shaking with indignation if anyone suggested that he should. He would at once set to work to remedy the drawback. Then the Fuel Economy Committee have shown their ignorance of existing conditions (including the consumers' own house piping) by suggesting that the minimum pressure of 2 in. should be on the outlet of the meter—meters which by Act of Parliament are tested for error at 5-10ths pressure!

Never, we should say, has the President of the Board of Trade had a case laid before him more devoid of practical consideration, than when this deputation appeared before him from the Fuel Economy Committee of the British Association.

Altered Features of the South Metropolitan Accounts.

THE Bill which the South Metropolitan Gas Company have introduced for promotion in the coming session of Parliament has invested its affairs with additional interest. It is perhaps well to describe the interest as "additional," because we are rarely long without something from the Old Kent Road that claims attention, which shows that no dull inertia is ever allowed to settle on the Company, but that activity reigns there, which, if not always consistent with the views of the remainder of the industry, indicates perfect independence. However, the Company's report and accounts for the past half year, which were in their main parts published in last week's "JOURNAL," are convincing that—if it should be that the legislative proposals of the Company in respect of the heat-unit basis of charging for gas (which is pretty safe) and of financial revision (which is the subject that is causing the greater anxiety at the present time) are carried before a Committee, and not left, as it is anticipated they will be, for a decision to be given on the Government measure—the Chairman of the Company (Dr. Charles Carpenter) would have an exceedingly weighty case to present in favour of the Bill on the experiences alone of the South Metropolitan Company. The accounts for the past half year bulge-out in every part with costs that have no comparison with periods when coal carbonized and gas sold were approximately the same—"no "comparison" because several of the items are now round about three times what they were before the war in respect of closely equal quantities. We see the result of this in the fact that though the revenue last half year was £2,441,412, the balance carried to net revenue account was only £188,220, as compared with £152,462 in the corresponding period of 1913, when the total revenue was £1,149,130—less than half the past six months' revenue, and yet yielding a balance only £35,758 less. Of course, coal, labour, and repairs and renewals are the chief culprits in all this upheaval of financial conditions, and in completely annihilating the sliding-scale, and reducing the portion of those who have provided the capital for conducting the business to a level which is an injury to the industry, and testimony to the inappreciation of the Parliament that passed the Statutory Undertakings (Temporary Increase of Charges) Act as to what in this particular constitutes justice, prudence, and safety.

During the six months, the coal carbonized amounted to 588,496 tons, or 67,731 tons more than in the December half of 1918. This extra quantity of coal was needed to meet the restoration and growth of gas consumption, amounting to 12·9 p.ct. This partly accounts (increased cost per ton caused the balance) for the outlay on coal totalling to £1,183,185, or £194,606 more than in the second half of 1918. Through the better yield of the secondary products (£809,562, compared with £539,352), the net cost of coal was brought down to £373,623. The difference of £270,210 in the contribution of secondary products was made up by coke yielding more by £224,354; breeze, £8223; tar and products, £3283; ammoniacal liquor and products, £34,351. It is interesting to note that the secondary products last half year made 68·4 p.ct. of the cost of the coal; while in the corresponding half of 1918 only 54·5 p.ct. was returned; and in the December half of 1913 70·5 p.ct. was returned. From the coal carbonized, 12,415 c.ft. of gas per ton was made last half year, which has close contrast with the 12,496 c.ft. made in the second half of 1918. It is observed that the coal in store at the close of last year was 179,030 tons, compared with 152,958 tons at December, 1918, and 187,161 tons at December, 1913. Thus at the end of last year the Company were in this respect in nearly the same position as at the close of 1913. But at what cost? The balance-sheet shows that the coal in store was valued at £358,668, which works out to rather more than £2 per ton; whereas the 187,161 tons at the close of 1913 stood in the Company's books at £135,691, or at about 14s. 6d. per ton. Speaking of the balance-sheet, another interesting item in the "stores in hand" is tar, ammonia, and products, which is responsible for £279,070, compared with £221,096 in the corresponding period of 1918, or £57,974 more. Of course, at the end of the December half of 1913, values were not the same; and the item then stood at £93,658. Taking the whole of last year, the Company carbonized 1,105,681 tons of coal. The Gas Light and Coke Company carbonized nearly double as much—2,082,059 tons; but their stores of tar, ammoniacal liquor and products only stood at December last at little more than half the amount of the South Metropolitan Company (£146,419)—despite the quantity of coal carbonized. Is it still the refusal to take part in the co-operative export scheme for sulphate of ammonia that accounts for the South Metropolitan Company having in this respect such a large amount of stores in hand, instead of money?

The fact that the sales of gas increased during the half year by 12·9 p.ct. over the corresponding period of 1918 has already been noted. This means that of a total consumption of 6,692,431,000 c.ft., 765,583,000 c.ft. was in excess of the comparative half year, of which excess 715,084,000 c.ft. was due to the private consumers, and 50,499,000 c.ft. to public lighting. This shows that consumers were pleased enough to get quit of the Fuel and Lighting Order. The

proprietors will be gratified to see that the first complete year free from war brought about more than a balance with the total consumption for the year 1914—the figures being 13,414,601,000 c.ft. for 1919, and 13,231,436,000 c.ft. for 1914; so that last year gave an increase over 1914 of 183,165,000 c.ft., or 1·38 p.ct. The revenue produced last year from gas was greater through the increased use and the higher price. The charge was 4s. 4d. in the Michaelmas quarter, and 4s. 8d. in the Christmas quarter, compared with 4s. and 4s. 4d. in the corresponding periods of 1918. Comparison is not therefore upon level ground. However, the total revenue from gas was £1,472,008, or an increase of £294,636, towards which private consumers contributed £284,262, and public lighting £10,374. Rents of meters, stoves and fires, and gas-fittings advanced to £158,219, or more by £48,162.

Returning to expenditure, the Company like all others are reaping in the outlay on their property the results of their inability during the war to maintain and renew on the lines that wise administration dictates, combined with the current costs of materials and labour. Through the items referring to repair, maintenance, and renewals run the expected evidence of what would have to happen. Repairs and maintenance of works and plant are up to £367,846, or an increase of £137,509 upon the second half of 1918. Repair, maintenance, and renewal of mains and service-pipes account for £78,632, or £31,686 more. Repair and renewal of meters cost £68,872, or an increase of £20,842. Repair and renewal of stoves absorbed £74,979, or more by £52,380. Upon the repair and renewal of gas-fittings £67,482 was spent, or an increase of £49,026. The total expenditure under these five headings was £657,811; the increase being £291,443. This increase is only 44·3 p.ct. of the total, which is remarkably modest, in view of the work to be done, and present cost of doing it. The total paid in wages in the six months was £812,592, or an increase of £236,549 as compared with 1918. The Directors in their report remark that the amount paid on account of wages has now reached a figure one million pounds per annum in excess of pre-war figures. There will be plenty of interesting material for the Chairman to handle in his speech at the half-yearly meeting to-morrow.

Correcting Electrical Errors.

OUR electrical contemporaries and certain of their contributors have been eminently successful in failing to grasp the fundamental facts concerning the relative positions of the gas and electricity industries in respect of the question of thermal efficiency, and some extraordinary mistakes have in consequence been made. There has been comment upon these from time to time in our "Electricity Supply "Memoranda," and the various fallacies have been pointed out. Silence has succeeded, until opportunity has offered for having a fresh outburst, and again the running of the electrical head against the wall of stubborn fact. Some rather offensive things have been written concerning Sir Dugald Clerk for telling the truth in his Society of Arts paper, which was followed by the classical report on the subject of the position of gas and electricity in coal conservation, in preparing which Prof. Arthur Smithells and Prof. J. W. Cobb collaborated. But all to no purpose—so far as the electrical Press is concerned. Its representatives refuse to understand. But they can no longer continue that way; for to-day in our columns Sir Dugald deals with the electrical mistakes and misunderstandings with such clarity that it seems impossible for anyone to still evade the correct issues. His article is accompanied by a diagram which cannot fail to assist to drive home the points made in the text. If this additional contribution from Sir Dugald does not make plain to the electrical intelligence the thermal position of the two industries in regard to the utilization of coal, then we shall have to regard it as a hopeless task to continue effort in that direction. A singular attitude of some of our electrical contemporaries is that they treat this matter as though the gas industry deny the right of the electricity industry to live. This error has been frequently pointed out in our columns; and now Sir Dugald puts the position taken up by the gas industry in plain terms and narrow compass when he says: "It is quite "true that it is necessary and advantageous to generate and "distribute 7·6 p.ct. of the energy of the coal burned in a "central-station furnace as electric current, notwithstanding "the initial loss of 92·4 p.ct. of the heat of the coal used. "But it is waste of electrical energy to dissipate the 7·6 "p.ct. for heating purposes." So much for that. The "Electrical Review" recently said that the electricity supply industry must fight and refute the case put forward by the gas interests. Perhaps (as it has gone so far astray itself) it will observe, and urge the matter upon the attention of the Council of the Institution of Electrical Engineers, that Sir Dugald would find great pleasure in discussing at a meeting of that body his Society of Arts paper and the report that he and Professors Smithells and Cobb prepared. This does not suggest a weak case.

Combinations of Gas Consumers.

Sheffield has a Gas Consumers' Association; and the President is Mr. David Flather. This gentleman appears to have a very bad opinion of gas companies; and, according to a letter in the "Daily Telegraph," he thinks it a very proper thing for gas consumers to combine for the purpose of exercising a "wholesome control" over gas companies. It is the quantity of incombustibles—amounting to about one-third in some cases—in the war-time gas that seems to be at the bottom of Mr. Flather's enthusiasm for combinations of gas consumers; and he fancies that he detects a tendency on the part of gas companies for a desire to continue this condition of things. But he points to the Beilby report with satisfaction, because, in his opinion, while it deals "generously" with the gas companies' interests, it will, if adopted, "safeguard the interests of consumers." We take it he is referring here to the proposed limitation of inerts. If this is so, then, on the Act being passed, the bottom will be knocked out of his argument for gas consumers' combinations. It is noticed that Dr. Carpenter has written to our morning contemporary, pointing out that Mr. Flather's criticisms have no foundation so far as the South Metropolitan Gas Company is concerned.

A Stand for the Liberty of Non-Unionists.

Everybody in the gas industry will admire the courageous defence that the Directors of the North Middlesex Gas Company and their Chief Engineer (Mr. L. Trewby) have made on behalf of the exercise of free will on the part of those they employ in respect of membership of trade unions. It is one of the strange characteristics of many trade unionists that while they claim wide freedom for themselves, they seek to deny the right of free will on the part of their fellows who prefer to remain outside the rules and regulations of trade unions. Like the North Middlesex Gas Company, we have no care whether men are unionists or non-unionists. But we do say that the former have no right to use the force of numbers to compel others to join the ranks of the unions. This is a free country; and where freedom to join a union exists, freedom to remain outside should also exist. Seven of the oldest and best servants of the Company are not trade unionists; and so no less than 130 men struck work, and for a time illegally jeopardized the gas supply in the Company's important area. The Company declined to do anything in the way of restoring peace by either insisting on the seven men joining the Union or of dismissing them. The residents in the district put up with the temporary inconvenience of reduced gas pressure. The Company called for help. Many new men were soon permanently engaged; the officials and clerks of the Company took off their coats, and attacked the work; and quite fifty volunteer workers—professional men several of them—came to assist in this fight for liberty among workers, and against the tyranny of trade unionists. Success rewarded the strenuous efforts, and the supply of gas became normal. Most of those who dismissed themselves from the Company's staff will find that there is no further use for their services—in fact, it seems questionable whether any of them will be taken back. It is only fair to state that the strike had not the sanction of the Union headquarters. The Chairman of the Company (Mr. A. M. Paddon) had very friendly discussions with leading representatives of the Union. He made it quite clear that there is not the slightest objection to recognize the Union, providing that any agreements arrived at are binding on the men, and, if they strike, the Company retain the right to dismiss them. This pronouncement does not in any way qualify the relationships between the Company and those men who have a preference for remaining outside the Union.

Daylight Saving Permanent in France.

France has a real faith in daylight saving during the lighter months of the year, quite apart from the fact that coal is now lamentably short in that country. Probably, however, that is the reason why "summer time" is to start there as early as Feb. 15 this and next year. The Bill that was recently passed by the Chamber of Deputies fixes thereafter March 15 as the date for beginning the annual daylight saving measure. No doubt we shall very shortly be hearing what our own Government propose to do in the matter. A few objectors have already been airing their views in the newspapers. But popular opinion in this country is largely in favour of the change; and to that opinion the objectors must bow.

Nationalization.

The campaign for the nationalization of the coal mines is being continued by the miners' leaders. According to Mr. Harry Gosling some 200 meetings and 24 big demonstrations have been held in different parts of the country; and all were in favour of the demand for nationalization. These meetings can represent only a small fraction of the taxpayers of the country; and naturally to such meetings those who are favourable to nationalization would be drawn to record their votes on any resolution to advance the "cause." It is the electorate generally who must decide a big national issue and suggested change of policy like this—not alone miners and other sympathetic trade unionists. The propaganda of the Miners' Federation is to continue. Last week there was another interview on the subject with the Prime Minister by the Parliamentary Committee of the Trade Union Congress and the Miners' Federation. It is understood that the demand for nationalization includes not only mines, but railways, shipping, and banking. This is a big order. Mr. Lloyd George, however, stands firm on the decision of the Government to acquire coal royalties, but not to nationalize the mines; and he intimated his intention to deal fully with the matter in a speech at the opening of Parliament. Mr. Asquith, at Paisley, has pronounced in favour of the Government's attitude in this matter; so that the Trade Unions are not encouraged to expect that the present Parliament will, or one under Mr. Asquith's leadership would, do anything to advance nationalization. Nothing but a general election, with nationalization as a straight issue, can give the Government any warrant for committing the country to a policy of nationalization; and we do not anticipate that the country will give that warrant. Even among the rank-and-file of the miners, there is not unanimity upon the question. However, the Trade Union Congress will have the difficult task of determining what the next move shall be. They will have to face the undoubted fact that the people of the country are more resolved than ever not to be dictated to, nor to have their rights taken from them, by any one section of the community. National questions must be settled by the national will.

INSTITUTION OF GAS ENGINEERS.

Council Meeting, Feb. 3.

THIS Meeting was held at 39, Victoria Street—the PRESIDENT (Sir Dugald Clerk, K.B.E.) in the chair.

It was reported that at the first annual convention of the American Gas Association, the President of the Institution had been elected an Honorary Member.

THE NEXT ANNUAL MEETING.

Consideration was given to the preliminary arrangements for the annual general meeting, which it was decided should be held in London on Tuesday, Wednesday, and Thursday, June 1, 2 and 3. The President and Lady Clerk propose to invite the Institution to a reception on the Tuesday evening; and it is intended to devote Friday to a visit to some place of interest near London.

MISCELLANEOUS BUSINESS.

The report of the Patent Laws Committee of the Conjoint Board of Scientific Societies was approved.

A Committee has been appointed to investigate the performance of various types of recording calorimeters, having regard to the probability of a statutory continuous calorific test.

It was decided to assist financially the work of the Atmospheric Corrosion Research Joint Committee of the Institute of Metals and the Royal Institute of British Architects. The Committee is to initiate researches with a view particularly to preventing the corrosion of brass, bronze, and copper fittings in common domestic use—including gas-fittings.

Mr. Thomas Goulden and Mr. A. E. Broadberry were appointed to represent the Institution at a conference at University College, London (arranged by the Institution of Heating and Ventilating Engineers), in regard to research work in heating and ventilating engineering.

The draft of the Civil Engineers (Registration) Bill which it is proposed by the Institution of Civil Engineers to introduce into Parliament, was considered. Representatives were appointed to meet a Committee of that Institution for the purpose of discussing various points of importance to the gas engineering profession in connection with the Bill.

The resignation of Mr. Alexander Wilson from the Advisory Committee of the Livesey Professorship of Coal Gas and Fuel Industries at the Leeds University was accepted with regret; and Mr. Thomas Glover, of Norwich, was nominated his successor.

An interim report of the Gas Investigation Committee was received and adopted. It was stated that the work at Uddingston is proceeding satisfactorily and that a report upon it would be available for the Institution's annual meeting.

The report of the Refractory Materials Committee on: (1) The Casting of Gas-Retorts, (2) Some Comparative Tests of Machine-Made and Hand-Made Silica Bricks, (3) The Specific Heats of Refractory Materials at High Temperatures (Part I.), was accepted and adopted for submitting to the Department of Scientific and Industrial Research. In connection with the first it was decided that the Institution should join with Dr. Mellor and the Lord President of the Department of Scientific and Industrial Research in an application for a patent for the process described.

A standard specification for the sampling and testing of spent oxide, submitted by the National Gas Council, was considered. After modification, it was approved for returning to them.

A report was given of the Fuel Research Board's conference on "Gas Standards," at which the Institution was represented. A memorandum upon the matter was subsequently published. The recommendations contained therein were approved.

Mr. A. T. Harris, of Market Harborough, and Mr. James Paterson, of Cheltenham, were nominated to represent the Institution at the congress of the Royal Sanitary Institute to be held in Birmingham on July 19 to 24.

A report was received from Mr. Alex. Wilson on the subject of the standardization of screw-threads. Reference was made to a conference of users and manufacturers which had been held in December last, and to the decision to postpone until January next an International Conference on the matter. In connection with this, the Council have appointed Mr. Wilson to represent the Institution on the Sectional Committee on Pipe-Threads formed by the British Engineering Standards Association.

Reports were received of the election for the ensuing year of Mr. W. W. Townsend, of Colchester, as District Member of the Council representing the Eastern Counties Gas Managers Association, and of Mr. A. J. Bond, of Aberavon, as representing the Wales and Monmouthshire District Institution of Gas Engineers and Managers.

DEATHS AND MEMBERSHIP CHANGES.

The deaths of the following members were announced, and the sympathy of the Council was expressed with the bereaved: Mr. W. B. Mimmack, of Pembroke Dock; Mr. William North, of Stourbridge, afterwards of Paignton; Mr. H. H. Salamons, of Brussels; Mr. Harold O. Timmins, of Hindley; Mr. Alfred West, of Oakenshaw; Mr. John F. West, of Stockport.

The following were approved as candidates for the next ballot: As Members, Mr. George Dixon, B Eng., of Lancaster; Mr. Rudolph H. Duxbury, of Batley; Mr. Walter Grogono, of Bromley-by-Bow; Mr. John C. Irminger, of Bergen; Mr. W. S. Venner, of Brentwood. As an Associate Member, Mr. W. B. Claridge, of Harpenden. As an Associate, Mr. E. B. Walton, of London.

Mr. John H. Clarke, of the Chapel Whaley and District Gas Company, and Mr. Edgar H. Martin, of the Harpenden District Gas Company were transferred from the class of Associate Member to Member. The following were admitted as Students: Mr. Francis J. Bengough, of Birmingham; Mr. Herbert P. Clark, of Barking; Mr. J. H. Goldsmith, of Dartford; Mr. John H. Greenacre, of Great Yarmouth: Mr. Alfred M'Nally, of Lisburn; Mr. E. T. Pickering, of Birmingham; Mr. James W. Simpson, of Liscard, Cheshire.

NATIONAL GAS COUNCIL—MIDLAND BOARD.

A Meeting of the Midland District Executive Board of the National Gas Council was held at the Grand Hotel, Birmingham, on Thursday last, under the presidency of Mr. George Stevenson, of Long Eaton. There was a large attendance; representatives being present from Birmingham, Leicester, Nottingham, Cheltenham, Coventry, Gloucester, Smethwick, West Bromwich, Oldbury, Brierley Hall, Dudley, Oxford, and a number of other places.

It was reported that many of the gas undertakings in the Midlands are on the verge of a breakdown in the supply of gas in consequence of the shortage of coal. Several undertakings are holding less than one week's stock of coal; and in the case of Birmingham it was mentioned that there is only sufficient to meet little more than two days' requirements at all the works of the Corporation Gas Department.

A resolution was passed requesting the National Gas Council to take immediate steps to call the attention of the Government to the serious situation which had arisen, with a view to its amelioration as soon as possible.

NOTE ON THE THERMAL EFFICIENCIES OF PRODUCTION, DISTRIBUTION, AND USE OF GAS AND ELECTRICITY.

By SIR DUGALD CLERK, K.B.E., F.R.S., M.Inst.C.E., President of the Institution of Gas Engineers.

THE electrical journals have lately devoted considerable attention to the discussion of this subject, and in so doing have made many references to my paper read at the Royal Society of Arts in March last year. The writers have failed to grasp the fundamental facts of the gas industry, and have consequently made comparisons which are quite erroneous. From week to week the "JOURNAL" has pointed out their errors, and shown clearly the real facts. Some part of the confusion of thought of the electricians arises apparently from the fact that carbonization is a three-product process, and the question of thermal efficiency is somewhat more complicated than is the case in the electrical industry, where the total fuel dealt with is completely consumed in the boiler-furnaces, and the one product is electrical energy.

I attempted to make my position perfectly clear in the paper; but perhaps I may be allowed to deal more particularly with some typical fallacies of the electricians. For this purpose, I have selected for examination two articles—that of the "Electrician" dated Dec. 5 last year, and that of the "Electrical Review" of Dec. 12. The two articles include nearly all the fallacies found in the general electrical press.

The "Electrician" considers that the 71 p.ct. efficiency of carbonization should not be compared with the 7·6 p.ct. efficiency of electrical generation and distribution (which is the present average result of electrical generation in the United Kingdom), on the ground that the gas industry delivers the 71 p.ct. in the form of gas, coke, and tar; while electricity has a higher potential value, notwithstanding its low percentage of generation.

It is quite true that it is necessary and advantageous to generate and distribute 7·6 p.ct. of the energy of the coal burned in a central-station furnace as electric current, notwithstanding the initial loss of 92·4 p.ct. of the heat of the coal used. But it is a waste of electrical energy to dissipate the 7·6 p.ct. for heating purposes. It is well worth while to produce electricity on these hard terms for the purpose of producing light and motive power, but certainly not for producing heat.

In comparing the heat-producing power of the two industries, it is necessary to remember that the thermo-dynamic transformations at the central station require the total destruction of 100 heat units to produce 8·5 heat units at the station; while the carbonization process uses 100 to produce 71. This number is properly used for comparing the total heat contents of the three products—gas, coke, and tar—with the total heat of the coal dealt with.

The "Electrician" gives the following statement of the heat energy contained in coal gas, coke, and tar by carbonization:

	Per Cent.
Coal gas	23·5
Coke	52·6
Tar	6·6
	82·7
Heat used	17·3
	100·0

This energy analysis was given by me in the paper. The "Electrician" states that the figures are considerably lower than the 71 p.ct. I have mentioned. This is not the case. The statement shows 82·7 p.ct. efficiency of carbonization and not 71 p.ct. It is higher, and not lower, than the average value used in the first part of the paper.

With reference to the article in the "Electrical Review," Mr. Klemens, the writer, makes many extraordinary mistakes. He begins by confusing the efficiency of carbonization, which ranges from 71 to 82·7 p.ct., with the efficiency of coal-gas production, which is estimated by me as an average of the country as 46 p.ct.; and he further confounds this figure with the ultimate efficiency of use of gas. He then attempts to deduce the efficiency of the various types of gas-consuming apparatus, and arrives at the conclusion that this value is only 28·2 p.ct. of the heat of the gas consumed by the various appliances. This value is for cooking apparatus only; and it is much too low for heating apparatus as a whole. Full details of the separate efficiencies of apparatus are given in a joint report on the "Coal Gas and Electrical Supply Industries of the United Kingdom," by Profs. Smithells and Cobb and myself. This report is dated April 14, 1919, and is addressed to my predecessor as President of the Institution of Gas Engineers. The following values are given in the report:

Gas-fires—radiation, conduction, and convection	60 to 70 p.ct. of the heat of the gas.
Boiling and heating water	50 to 80 ,, ,,
Gas cooking by oven—Mr. A. H. Barker, 7·5 to 20 p.ct. He gives the mean value for the country 11 p.ct.	11 ,, ,,
Industrial steel heating (Sir Robert Hadfield)	32 ,, ,,

From these figures, I estimate the following mean values:

	Per Cent.
Gas-fires	65
Boiling and heating water	60
Gas cooking by oven	11
Steel heating	32
	168

If equal quantities of gas be used for each of the four purposes, then the average efficiency of the use of gas at the apparatus is $\frac{168}{4} = 42$ p.ct. The average efficiency of gas-heating apparatus in use is thus 42 p.ct.—not 28·2 p.ct. as stated by Mr. Klemens.

Mr. Klemens states that, "electricity can be used for cooking and heating purposes with an average efficiency of 90 p.ct." This is quite incorrect. The correct values, as given in the report, are as follows:

	Per Cent.
Electric heating of rooms	100
,, ,, and boiling water	60
,, cooking in oven (Mr. A. H. Barker)	21
Industrial metal heating (Sir R. Hadfield)	51
	235

Assuming equal quantities of heat used for each of these four applications of electricity, the average efficiency of use of electricity at the apparatus is $\frac{235}{4} = 59$ p.ct. (nearly). The efficiency of use in the heating apparatus for electricity is thus 59 p.ct., not 90 p.ct.

Mr. Klemens, in dealing with the so-called one-watt lamps, states that such lamps always consume one watt per candle. This is quite incorrect, as Mr. Klemens will find if he takes the trouble to consult his electrical friends with practical experience in these matters. Or if he refers to the "Incandescent Electric Lamp Handbook" No. 1A, pp. 29 and 31, published by the British Thomson-Houston Company, Ltd., he will find these lamps vary in consumption from 1·35 to 1·15 watts per candle between the lamp candle powers of from 8 to 50 candles; and that it is only when the lamp is large enough to give 100 candle power that the consumption falls to 1·05 watts per candle. The value of 1·2 watts, to which he objects, is the value taken by me as a fair average.

Mr. Klemens also makes a great mistake in the heat value of the coke and tar products of the carbonization of coal taken by him as an example. He only allows 9·512 million B.Th.U. as the heat of combustion of the coke and tar produced by the carbonization of 2 tons of coal, instead of 26·791 million B.Th.U., the actual heat value of the coke and tar in the particular case with which he is dealing.

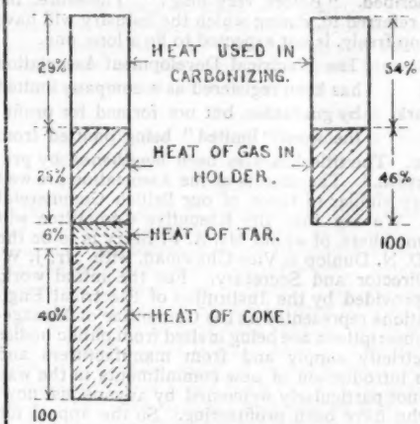
In addition to these errors, he attempts to compare 71 p.ct. carbonization efficiency with electric generation of 20 p.ct. supposed to be possible in the future. He compares his version of the present average efficiencies of gas manufacture, not with the present average efficiency of electricity but with the future promise by the super-stations which do not yet exist. He should have completed his comparison with the present average of electrical generation with its low value of 8·5 p.ct. But 8·5 p.ct. efficiency does not allow for distribution from the central station. After distribution, the value falls to 7·6 p.ct.; and this also makes a material difference in his cumbrous method of calculating his comparative balance-sheet.

In order to enable the calculations given in my Royal Society of Arts paper to be more easily followed, I have prepared a diagram, which hardly requires explanation. It shows the whole effect of the carbonizing, gas-making, distributing, and using processes, and the thermal efficiencies from step to step for heating, motive power by gas-engine, and lighting by incandescent gas-lamp. It also shows the same course for electricity generation and use. It may be useful to those who may desire to re-study my paper or the more detailed report above referred to. The diagram deals only with the gas industry with a carbonization thermal efficiency of 71 p.ct., a gas production thermal efficiency of 46 p.ct., and an electric generating efficiency of 8·5 p.ct. These values represent the actual averages of both the industries in the United Kingdom at present. If Mr. Klemens takes the trouble to go through the calculations and correct the many serious errors in his calculations, he will doubtless agree with me that the substitution of electricity for the general services at present performed by gas will result (as shown on the lower part of the diagram) in the consumption of 265 tons of coal for the electricity generation necessary to do the work of the heat equivalent of 100 tons at the gas-works.

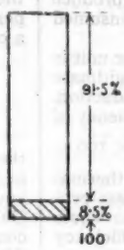
Some confusion of thought appears to have arisen with regard to the relationship between the thermal efficiency of carbonization and that of gas production. Heat consumption in any process is incurred in order to secure some product or products of special utility not existing in the original substance. Naturally, no operation would be undertaken unless its results increased this utility. That is, no engineer would carbonize coal by means of special

THERMAL EFFICIENCY OF PRODUCTION, DISTRIBUTION AND USE OF GAS AND ELECTRICITY

GAS



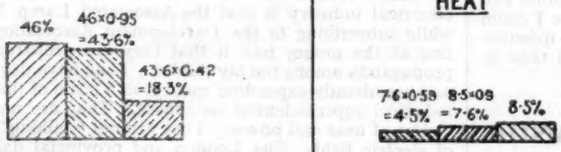
ELECTRICITY



COMPARISONS

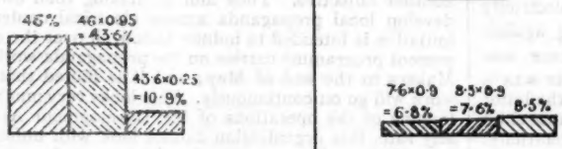
$$\frac{\text{HEAT CONTENT OF GAS}}{\text{HEAT EQUIVALENT OF ELECTRICAL ENERGY}} = \frac{46}{8{\cdot}5} = 5{\cdot}4.$$

HEAT



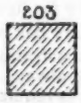
$$\frac{\text{UTILIZED HEAT UNITS BY GAS}}{\text{" " " " ELECTRICITY}} = \frac{18{\cdot}3}{4{\cdot}5} = 4 \text{ (APPROXIMATELY)}$$

POWER.



$$\frac{\text{UTILIZED HEAT UNITS BY GAS}}{\text{" " " " ELECTRICITY}} = \frac{10{\cdot}9}{6{\cdot}8} = 1{\cdot}6$$

LIGHT.

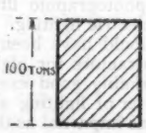


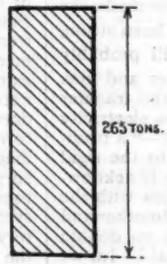
CANDLE-POWER HOURS PRODUCED BY THE CONSUMPTION OF 1 LB OF 13,000 B.TH.U. COAL AT THE GAS WORKS.

CANDLE-POWER HOURS PRODUCED BY THE CONSUMPTION OF 1 LB OF 13,000 B.TH.U. COAL AT THE GENERATING STATION

$$\frac{\text{C.P. HOURS PRODUCED BY GAS}}{\text{" " " " ELECTRICITY}} = \frac{203}{241} = 0{\cdot}84.$$

COAL CONSUMPTION FOR EQUAL PERFORMANCE





TO SUPPLY ELECTRICALLY THE NUMBER OF USEFUL HEAT UNITS, HORSE-POWER HOURS, AND CANDLE-POWER HOURS AT PRESENT FURNISHED BY THE GAS INDUSTRY, FOR EVERY 100 TONS OF COAL USED IN GAS MAKING 265 TONS WOULD BE REQUIRED AT THE ELECTRICITY GENERATING STATION

$$\frac{\text{COAL CONSUMPTION AT GAS WORKS.}}{\text{" " " GENERATING STATION}} = \frac{100}{265} = 0{\cdot}377$$

apparatus, and consume heat in so doing, unless he knew that he thereby produced substances of greater economic value. If the value of the unit of each of the three products be equal, then the loss incurred—in this case 29 p.ct.—should be distributed *pro ratâ* between each item in the heat balance-sheet. Then the thermal efficiency of production of coal gas, coke, and tar would for each separately be 71 p.ct. But the unitary values of these products are not equal. The value of coke as compared with the original coal cannot be considered as increased; but its heat value per ton being substantially the same, and as available as that of the original coal, it has been regarded as possessing an equal unitary value. As heat would not be expended by the engineer to produce this result, no part of the total loss should be allotted as consumed for the production of the coke.

The tar product is in a different position. Its value per unit is as great as that of gas, if not greater; and it would be legitimate to consider part of the heat expended as used for tar production. In this case, assuming only equal unitary value, the efficiency of production of both gas and tar would be $\frac{25+6}{(25+6)+29} \times 100 = 51{\cdot}7$ p.ct. Gas and tar would thus have each the same thermal efficiency of production. In the paper and report the gas product has been taken as requiring the consumption of the whole of the heat used—namely, 29 p.ct.; and the thermal efficiency has been calculated as $\frac{25}{25+29} \times 100 = 46$ p.ct. In this case the tar, like the coke, has been assigned no greater unitary value than the original coal. This represents the lowest efficiency which can be adopted for the generation of coal gas, and explains the procedure shown in the diagram deducing the efficiency of gas production from the efficiency of carbonization. The coke and tar being, in this limited sense, looked upon as equivalent to coal, are left out of account in the part of the diagram showing the efficiency of gas production.

It would give me great pleasure to discuss my Royal Society of Arts paper and the report of Prof. Smithells, Prof. Cobb, and myself, at the Institution of Electrical Engineers, where I could meet competent electricians in a friendly debate. The question of the future efficiency both for gas and electricity could then be debated in a fair and honorable way.

ELECTRICITY SUPPLY MEMORANDA.

FROM the 23rd ult., the electricity industry ceased its old connection with the Board of Trade, and passed over to the jurisdiction of the Ministry of Transport. There was not the slightest fuss made over the change; and the electricity papers are not now declaiming against what cannot be avoided. There was formerly almost perfect accord among them, and this was a fairly general view in the industry, against the affairs of the latter being brought under the surveillance of a Department whose chief functions were to be devoted to transport, and not to electricity. And when Standing Committee B excised from the Electricity Supply Bill the clause which was to bring about the transfer, there was great (we were nearly writing wild) enthusiasm over release from the threatened thraldom, because the industry strongly suspects that the object of the Ministry of Transport is to ensure that electricity primarily serves transport, and only secondarily the requirements of urban and industrial life. When the clause was restored, the fact received little more than bare notice. Now what was resisted has come about; and the industry has to make the best of the position. We do not anticipate the Ministry of Transport will ill-treat its unwilling charge. Why should it? It will be to its interests to see that it has all that will enable it to develop on the most economical and fruitful lines. Besides the Electricity Commissioners will be the real active spirits in looking after the affairs of the industry. The men of the industry are anxious for intelligence as to who are to be the Commissioners. They know that Sir John Snell is to be the chief; but, beyond one or two uncertain rumours, the names of his colleagues (at the time of writing) are not public property. Probably there is some difficulty in getting suitable men to fill the position; but the days cannot be many before an announcement is made as to the constitution of the team.

Switched-Over.

A Final Kick.

Now that the transfer has been made, the electrical papers which have been strong in their objections to it will probably deem it good policy to play up to the new Minister and kick the Board of Trade. "Electrical Industries" hails the transfer as a break with a tradition that was extended to the electricity industry in the year of the first Electric Lighting Act—"a tradition which subjected a young, progressive industry to the rigid control of official despotism." The Board of Trade, it acknowledges, meant well, but it carried out its statutory duties with the most saintly conscientiousness. "As a blend of grandmother and sergeant of police, the Board of Trade was grotesque no doubt; but it was wonderfully efficient." "Efficient" in what? In, we take it, acting the part of "grandmother and sergeant of police." If blame there be, it should be charged to the proper quarter, and that quarter is constituted of Acts of Parliament only within the power limits of which the Board could move. They were bound to administer the Acts, and had no authority to do or to create anything outside them. However, "Electrical Industries" thinks that for a period, at least, the industry will have a chance to develop freely. But belief fades as it looks ahead. Its experience is that "every Government Department, however enthusiastic an aid to progress and to enterprise in its early years, tends to become autocratic, extending its control stage by stage in a kind of fungus of restrictive legislation." This seems something horrible, and certainly not very hopeful; and our contemporary feels that "before very long" it will be the function of the Electricity Commissioners to stand between the industry and the tendency described. "Before very long!" Therefore, the period previously referred to, during which the industry will have a chance to develop freely, is not expected to be a long one.

Overlapping Propaganda Work.

The Electrical Development Association has been registered as a company limited by guarantee, but not formed for profit; the word "limited" being omitted from the title by licence. The title has also been lengthened by prefacing it with "British." The objects of the Association are well known; being very similar to those of our British Commercial Gas Association. We see that the Executive Committee will consist of eleven members, of whom Mr. A. F. Berry is to be the Chairman. Mr. D. N. Dunlop is Vice-Chairman, with Mr. J. W. Beauchamp as Director and Secretary. For the initial work, funds have been provided by the Institution of Electrical Engineers and Associations represented on the Committee of Management; and now subscriptions are being invited from public bodies interested in electricity supply and from manufacturers and contractors. The introduction of new commitments in the way of expenditure is not particularly welcomed by anyone just now, except by those who have been profiteering. So the appeal for funds by the new organization has come at a very awkward time; and propaganda work, like everything else, costs much more now than before the war. Yet another movement in the electrical industry is that the Associated Lamp Manufacturers, while subscribing to the Development Association, are not putting all the money into it that they are prepared to spend on propaganda among the lay public. They have devised a scheme, and are already expending money on a scale of (in the electricity industry) unprecedented lavishness. They are not ignoring the claims of heat and power. They are not "talking" of lamps, but of electric light. The London and provincial daily and weekly papers and the trade organs are their vehicles of communication. Not only advertisements but short articles and paragraphs are issued—these particularly to the papers reaching factory owners and shopkeepers. The Associated Lamp Manufacturers have another objective. They aim at making their own propaganda develop local propaganda among electrical contractors. Their initiative is intended to induce action all over the country. The present programme carries on the propaganda work of the Lamp Makers to the end of May; and it is hinted that probably the work will go on continuously. This looks very much like an overlapping of the operations of the Development Association. At any rate, this organization cannot look with unfeigned pleasure upon a flow of money in general propaganda outside itself. It would rather the flow took place through it.

Artificial Daylight and Factory Illumination.

The gas industry must note the efforts that are being made to promote the use of electricity for lighting for special purposes. There has been a lot said lately about artificial daylight; and demonstrations have been made of methods for producing this, but always with electric lamps. Artificial daylight is something that is required for numerous purposes—for matching colours, for example, in textile and drapery establishments, in studios, wall paper factories, in all places, in fact, where concordance of colour or shade is desired. It is desirable that the gas industry should know exactly where it stands in this matter, because the artificial daylight idea is spreading among people concerned in presenting colours at all times of the day in their true tones. We know that the spectrum of incandescent gaslight approaches very close to that of sunlight, and especially so high-pressure gaslight. If this is so, then no great correction should be necessary to ensure precise harmony with natural daylight; and this should be some advantage. But the subject is one requiring expert investigation. Then there is the question of ordinary factory lighting. The first issue of the "Technical Pamphlet" of the British Industrial "Safety First" Association treats of good lighting as an aid to safety. It is also an aid to the increase and maintenance of production, though not to the same extent as it was when longer hours were worked in factories. The author of the article in the pamphlet is Mr. Leon Gaster. He does not go out of his way in the text to mention any particular form of illuminant; but all the photographic illustrations and diagrams he has adopted refer to electric lighting. We are rather surprised at this, because there should have been no difficulty—especially by applying to the contractors for high-pressure gas systems—in showing some remarkably good examples of factory lighting by gas. In this matter of lighting agents, we hope the "Safety First" Association is as impartial as the Illuminating Engineering Society professes to be, and we believe is. Of the Society Mr. Gaster is the Hon. Secretary; and the fact is proclaimed in the heading of the article that he is Editor of "Illuminating Engineer." Yet there is not a single illustration of good

lighting outside that provided by electricity. Apart from this, there is no reason why the very best lighting should not be provided in all factories, as it only represents a fraction of 1 p.ct. of the total production costs. A diagram in the article analyses the costs in a typical machine shop. Of total production costs, materials stand for 38 p.ct.; labour, 31 p.ct.; overhead and miscellaneous charges, 28 p.ct.; power, 2·7 p.ct.; lighting, 0·3 p.ct. In connection with the Government electricity scheme, a great deal was made about the provision of "cheap" electricity having a miraculous effect upon economy in industry. When it is seen that power costs are put as low as 2·7 p.ct. of the total, one would like the Government to explain how they thought their power scheme was going to have any material effect upon industry. There are many people who are persuaded that, if the original scheme proposed to the Government, and adopted by them, had been carried out, the result would have been not a reduction of electric power costs, but an increase.

Fuel from the Gas-Works.

In recent articles in electrical papers, there has been a little contemptuous talk as to the gas industry trying to palm off on to the electricity industry fuel in the shape of coke of supposed inferior value; and one writer not long since appeared to regard as an absurdity the use of tar as a fuel. Of course, it would be absurd to employ it as a fuel if it could be put to more profitable use. Some comparative test figures which have been published from Australia, show what has been done with tar in Sydney in three Babcock and Wilcox water-tube boilers, which have been running two years on tar of a calorific value of 15,000 B.Th.U. per lb. The tests included steam coal of a calorific value of 13,200 B.Th.U. per lb. and coke of a calorific value of 12,500 B.Th.U. The tar gave a boiler efficiency of 72 p.ct., coke 64 p.ct., and coal 60 p.ct. The tests were of eight hours duration on a working steam pressure of 150 lbs. In view of the controversy as to the suitability of gas-works fuels for electricity generation, the results are worth reproducing:

	Coal. Lbs.	Coke. Lbs.	Tar. Lbs.
Water evaporated	55.265	54,565	60,000
Fuel used	7.952	7,840	6,360
Water evaporated per pound of fuel	6·95	6·96	9·43
Equivalent evaporation per pound of fuel from and at 212° Fahr.	8·27	8·30	11·20
	B.Th.U.	B.Th.U.	B.Th.U.
Total heat transmitted per pound of fuel	7,989	8,041	10,901
Heat evolved per pound of fuel	13,200	12,500	15,000
	P.Ct.	P.Ct.	P.Ct.
Boiler efficiency	60	64	72

For one hour, the boilers carried an overload of about 9 p.ct.

What have the critics to say to these figures for both coke and tar? We do not suppose for a moment that tar will ever receive any considerable adoption in this country for steam-raising as it is required for other purposes. But it will be noticed that the despised coke has a higher efficiency than the steam coal; and there is some confirmation here of what Mr. E. W. L. Nicol, the expert for the London Coke Sales Committee, has been telling the electricity industry over and over again. Speaking of Mr. Nicol reminds us of his "Sandwich" system of using coal and coke, which he described in the "JOURNAL" some time ago. We see that Mr. S. L. Pearce, the Electrical Engineer to the Manchester Corporation, has been exciting some interest in electrical circles by the installation, at the Stuart Street station, of a 25,000 KW. turbo-alternator set. The fuel used consists of coke breeze and coal; and it is fed on to the grates on the "Sandwich" system—a layer of coal on top of a layer of coke.

Daylight Saving and Electricity Consumption.

There have been several letters in the papers against a continuation of daylight saving in summer time—the writers having in view a single reason for reverting to the old order of things. This is one of those questions, however, over which major advantage has to give way to minor disadvantage; and the extra hour of daylight in the evening is something which is very acceptable to the masses of the people. It does not affect the gas industry to any considerable extent, because the growth of the cooking load and the use of gas in industry have brought compensations. Where gas is employed for these purposes, it displaces the consumption of coal; so that the original intention of coal economy is still served. It affects the electrical industry more perhaps than the gas industry, because of the saving in lighting; and there is little else worth speaking of in domestic consumption in the summer. Now, too, that shorter hours are being worked in industry, the power load will also be affected. "Electrical Industries" has published statistics relating to 51 German electricity concerns, supplying towns with an aggregate population of 600,000. In 1915 these undertakings furnished some 154 million KW.-hours, of which 28·5 millions were for lighting. During the summer months—May to September—the current supplied amounted to 5,760,000 KW.-hours in 1915, and 5,282,000 KW.-hours in 1916. During the summer months the consumption in 1916 declined considerably compared with that of 1915—just 8·6 p.ct.—because of the adoption of summer time. The restriction has therefore been rather injurious to the current-producing factories.

COMMERCIAL GAS COMPANY.

Annual Report and Accounts.

THE following is the report for the year ended Dec. 31 last, which the Directors of the Commercial Gas Company will present at the meeting of shareholders on Thursday.

The Directors reduced the price of gas from 4s. 2d. to 3s. 8d. per 1000 c.ft. as from the taking of the meter indices at Christmas, 1918; but, owing to the increased cost of materials and labour, they were compelled to reimpose a charge of 4s. 2d. per 1000 c.ft. as from Christmas, 1919.

The Board of Trade have amended the Commercial Gas (Temporary Increase of Charges) Order, 1918, enabling the Company to pay, while the Order is in force, the statutory dividends under the Company's sliding scale when the price of gas does not exceed 3s. 8d. per 1000 c.ft.

Under the provisions of the Coal (Pit's Mouth) Prices Order and Direction, 1919, gas companies are authorized to deduct from their accounts with the colliery owners or dealers a sum of 10s. in respect of each ton of coal used in the manufacture of gas for domestic purposes; and the Controller of Coal Mines has issued instructions that the sums so recovered shall be disbursed by an allowance per 1000 c.ft. to the consumers of gas for domestic purposes. It has been estimated that the amount to be allowed to the consumers in respect of the Quarter ending Ladyday next, will be 7½d. per 1000 c.ft.

The revenue account shows a profit for the year of £94,284 which, added to the balance of £43,258 brought forward from the previous year, equals £137,542. Deducting therefrom £25,785 for interest and stamp duty, and £32,688 in respect of the dividend paid for the June half year, there remains an available balance of £79,069, out of which the Directors recommend the payment of dividends for the December half year at the statutory rates of £3 6s. 8d. p.ct. per annum on the 4 p.ct. stock, and on the 3½ p.ct. stock £2 13s. 4d. p.ct. per annum, both less income tax. The balance of the net revenue will be carried forward to the credit of the current year.

The Directors announce, with much regret, the death of their esteemed colleague, Sir T. F. Victor Buxton, Bart. In conformity with the Acts of Parliament regulating the Company, they have elected the Rt. Hon. Sir Horace Brooks Marshall, K.C.V.O., to the seat on the Board thus vacated. Messrs. W. G. Bradshaw and R. Y. Bevan and Sir H. B. Marshall, three of the Directors, retire by rotation, and, being eligible, offer themselves for re-election. Mr. G. W. Ilsley, one of the Auditors, goes out of office by rotation, and, being eligible, offers himself for re-election.

A resolution will be submitted to the meeting for increasing the remuneration of the Directors.

WILLIAM GRAHAM BRADSHAW, *Chairman.*

Gas-Works, Stepney, Jan. 22, 1920.

The Accounts.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on Dec. 31 last amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £254,298 remained unissued out of the total authorized capital (including premiums) of £2,340,000. The total amount borrowed at this date was £339,062 10s., and £135,937 10s. was added by conversion, making a total of £475,000, and leaving £114,226 to be borrowed, out of the £585,000 authorized. The capital account receipts amount, with premiums, to £2,606,065. The expenditure stands at £1,455,006, with a nominal amount of £1,212,812 added by conversion—together £2,667,819. There is thus a balance of £61,754 carried to the balance-sheet. A sum of £7850 was during the year expended on freehold land, plant, &c.; £610 on new and additional mains and services; and £688 on new and additional meters. But £59,670 is credited for steamships, plant, meters, and prepayment meters and fittings. The reserve fund amounted at the close of the year to £45,797, and the insurance fund to £28,356.

The following is the revenue account:

Receipts.

Sale of gas—			
Per meter (number in use, 115,725) at 3s. 8d. per 1000 cubic feet	£655,948 19 2		
Public lighting and under contracts	15,410 6 6		
		£671,359	5 8
Rental—			
Meters (25,534)	£7,055 7 8		
Stoves (89,663)	29,901 12 6		
Prepayment meters and fittings (89,588)	47,992 15 8		
Maintenance of mantles and fittings	1,663 16 5		
		86,613	12 3
Residual products—			
Coke, less £20,382 5s. 1d. for labour	£217,422 1 11		
Breeze, less £3955 7s. 10d. for labour	875 14 1		
Tar	43,282 13 4		
Ammoniacal liquor and sulphate of ammonia	38,405 1 6		
		299,985	10 10
Miscellaneous receipts—			
Rent receivable	£68 7 0		
Transfer fees	51 8 6		
		119	15 6
Total receipts		£1,058,078	4 3

Expenditure.

Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£504 870 13 8		
Salaries of engineer and officers at works	10,313 15 3		
Wages (carbonizing)	51,875 6 0		
Purification, including labour	5,896 11 6		
Repair and maintenance of works and plant, materials and labour (less £1357 17s. 3d. received for old materials)	139,386 5 11		
		£712,342 12 4	
Profit sharing		5,991 12 1	
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	£24,706 7 8		
Repair, maintenance, and renewal of mains and services, material and labour	33,211 10 4		
Repair and renewal of meters	13,247 14 0		
" " " " stoves	36,930 5 9		
" " " " prepayment meters and fittings	33,194 1 10		
Maintenance of mantles and fittings	3,985 15 6		
		145,275 15 1	
Public lamps—lighting and repairing		11,873 0 0	
Rent, rates, and taxes		32,932 1 2	
Management—			
Directors' allowance	£2,500 0 0		
Company's Auditors	150 0 0		
Salaries of Secretary, Accountant, and clerks	4,077 16 10		
Collectors' salaries and commission	4,874 6 9		
Prepayment meter collection	16,897 9 2		
Stationery and printing	5,181 4 10		
General charges	5,686 9 2		
		39,367 6 9	
Bad debts		149 9 11	
Law and parliamentary charges		420 14 6	
Superannuations, Pension Fund, and Workmen's Benefit Society, &c.		11,646 11 7	
Official officers, &c.		277 14 9	
National Health and Unemployment Insurance		1,203 0 9	
Allowances to employees on active service		2,314 9 7	
Total expenditure		£963,794 8 6	
Balance carried to net revenue account		94,283 15 9	
		£1,058,078 4 3	

Total wages paid in 1913, £119,010
" " 1919, £303,403
Total salaries paid in 1913, £22,976
" " 1919, £44,285

Statement of Coal and Oil.

	In Store Dec. 31, 1918.	Received During Year.	Carbonized During Year.	Used and Sold During Year.	In Store Dec. 31, 1919.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	25,175	228,923	228,122	541	25,435
Oil—gallons	516,585	710,903	974,737	..	252,751

Statement of Residual Products.

Description.	In Store Dec. 31, 1918.	Made During Year.	Used During Year.	Sold During Year.	In Store Dec. 31, 1919.
Coke—tons	5,420	153,981	21,852	132,250	5,299
Breeze—tons	4,274	16,109	..	13,843	6,540
Tar—gallons	752,687	2,198,751	..	2,108,489	842,949
Ammoniacal liquor—butts of 108 gallons	9,134	80,646	80,269	..	9,511
Sulphate of ammonia—tons	180	2,627	..	2,620	187

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Thousands.	Thousands.	Thousands.	Thousands.	
4,158,151	55,518	3,735,510	3,854,100	3787

The last statement is the balance-sheet, which gives the value of the stores in hand at the close of the year, as follows: Coal, oil, &c., £44,477; coke and breeze, £9155; tar, ammoniacal liquor, sulphate of ammonia, &c., £26,532; sundry stores, £62,498—total, £142,662. The figures this time last year were: Coal, oil, &c., £66,650; coke and breeze, £8450; tar, ammoniacal liquor and products, sulphuric acid, &c., £22,681; sundry stores, £66,846—total, £164,628.

At a meeting at the Society of Arts next Tuesday of the Institution of Petroleum Technologists, a paper will be read by Dr. W. R. Ormandy, entitled "Recent Patents on Mixed Fuels."

The second quarterly meeting of the session of the Scottish Junior Gas Association (Eastern District) will be held at Kirkcaldy next Saturday afternoon. After an inspection of the gas-works, Mr. William Geddes, of Granton, will read a paper on "Restrictions and Reconstruction."

On Thursday evening of this week, there will be a meeting of the Midland Junior Gas Association in the Council House, Birmingham, when paperettes will be read on "Boosting Gas Pressures," by Mr. T. H. Poulson, of Stafford, and "From Service-Pipe to Nominal Ledger," by Mr. W. P. Timbrell, of Birmingham.

THE IDEAL HOME EXHIBITION.

South Metropolitan Gas Company's Achievement.

THE Ideal Home Exhibition is with us once more; and until the 25th inst. it will be possible for anyone—and many thousands will avail themselves of the opportunity—by journeying to Olympia, to pick up some useful "wrinkles." The very title of the exhibition makes a general appeal; and it is an appeal which people can safely be recommended to give heed to. Going back to the time before the war, one remembers that the Ideal Home Exhibition was a good one; and now, in altered and far more difficult conditions, the latest of the series, which was opened last Wednesday by H.R.H. the Princess Alice, Countess of Athlone, is if anything even more pregnant with interest than anything that has gone before. It is a result of which the "Daily Mail" (to whose enterprise the exhibition owes its origin) has every reason to be proud; for it has been rendered possible of attainment only at the cost of pains and money.

The Housing Problem.

The problems of which solutions are submitted are many of them serious, and one or two, at any rate, vital to the welfare of the nation. As a matter of fact, prizes of the value of £2700 have been put up by the "Daily Mail" so as to secure the expert ideas and designs now on view at Olympia. Of this amount, no less than £2000 was apportioned to architects for the best designs of ideal homes for workers; and three of the designs are erected, to a height of about 4 ft. 6 in., in the annexe. They are there with their coal-grates and their gas-cookers, wash-boilers, and other apparatus for everyone to see. These constitute a portion of the Ministry of Health official exhibits—the annexe having been placed at the disposal of the Ministry for the purpose of submitting suggestions on housing. There are also other four cottages—a pair urban and a pair rural—built under the direct supervision of the Architects of the Ministry (Mr. S. B. Russell and Mr. C. E. Simmonds), according to plans officially sanctioned and available for the building of houses in all parts of the country. There is also an official exhibit (which takes the form of an ideal allotment) by the Ministry of Agriculture; and among the many other features are some labour-saving rooms, and prize proposals for labour-saving houses. Conferences on the housing problem, to be held during the exhibition, have been arranged by the Royal Institute of British Architects and the Garden Cities and Town Planning Associations.

This is a convenient point at which to draw attention to an exhibit which some visitors might possibly otherwise overlook. We refer to a model of the all-gas house of the Plymouth and Stonehouse Gas Company, which was described in the "JOURNAL" for Dec. 23 last. It is a beautiful model, made by the Company's workmen at Coxside; and the furniture was made by the Lord Roberts Memorial Workshops. The arrangement of the whole of the gas fittings and apparatus is clearly shown. The Company are building a house from the same plans for one of their foremen on the works. The stand where the model is to be seen is that of Messrs. Pinchin, Johnson, & Co., Ltd. [No. 104, ground floor.]

A Representative Gas Undertaking

But to come from the general to the particular. The ideal home includes gas; and so does the Ideal Home Exhibition. Perhaps the most prominent site in the whole of the lay-out has been secured by the South Metropolitan Gas Company. This is fortunate—for the exhibition, because no brighter or more attractive display could have been found for the space; for the Company, because they permit their efforts to be fully appreciated by the visitor; and for the whole of the gas industry, because it is bound to benefit by the enterprise of the Old Kent Road. Those who can, should see the display; for it is a real education in itself. Remembering what was done by the same Company in 1913, much will, no doubt, be expected by the visitor; but in this case expectation is not likely to be better than realization.

It is manifest at a glance that the scheme has been arranged and executed by someone possessing the eye of an artist and the mind of a gas man. From afar—for a good view of the stand can be obtained at quite a distance away—the eye is attracted by the colour and brightness of the display. Handsome shades on graceful fittings demonstrate that there is no need to look beyond gas for a lighting equipment which will harmonize with any style of furniture. There are fittings, both plain and ornamental, to suit every position in any house, either large or small; and all are tastefully arranged amid pleasing surroundings. And speaking of fittings, there is, among so much that is modern, one object which will excite the admiration and the envy of many of the visitors. This is a very old Japanese lantern, with hand-painted glass panels—hung well out of everybody's reach.

The brilliant illumination of the stand is provided solely by "Metro" burners; and a large portion of the exhibit is devoted to giving some insight into what has to be done in the Company's physical laboratory in the preparation of the "Metro" burner for the market. It is a "working exhibit" in every sense of the word. By the aid of two shifts, each consisting of twelve trained women, there is shown the whole process of preparing the discs for the "Metro" burners, from the punching-out to the spinning in. There are also to be seen the component parts of the burner being gauged. An inquiry elicited the surprising information that each burner and globe complete has to be passed by some

45 gauges before being sent out. The ejector is also tested for straightness of the flame, &c., before the burner is assembled—both these processes being seen in operation on the stand. The public will be able to convince themselves here that the preparation for sale of a scientifically accurate gas-burner is not so simple matter as it may hitherto have appeared to them to be. They can see what a standard gas-burner, without any adjustments, really means. In connection with this work, there is a small gas-engine driving a compressor and one or two other machines; and discussing this, one learns that it is possible to generate electricity by means of gas at present prices, and including all charges, at a cost of 1½d. per Board of Trade unit.

Another part of the stand has been made into a sort of rest-room, in which people can sit down—and incidentally absorb sound knowledge on the uses of gas. Information can be got by word of mouth; for a large and efficient staff is in attendance to give all required particulars or to clear away any lingering doubts. But should the visitor feel shy, there is really no need to ask any questions, inasmuch as there is available a plentiful supply of good literature; and about the exhibit are panels which contain statements, briefly put and to the point, of matters which will interest those who pause to inspect the display. A "Metro" iron and two handsome "Metro" fires are on view; while there is also the "Metro" pilot-lighter, fitted to a cooker as well as to pendants. Throughout, the exhibit is an intensive one. There is to be seen a Ewart geyser, as well as a Potterton No. 721 complete apparatus specially designed to meet domestic requirements in flats and houses of moderate size. The Potterton apparatus is in operation supplying hot water to a bath and lavatory basin. It is provided with automatic control.

The "Nautilus" Gas-Fire Flue.

What has been said of the artistic character of the South Metropolitan Gas Company's stand should be repeated in connection with the delightful exhibit of the Architectural Decorations Department of the Nautilus Fire Company, Ltd. (Proprietors: the Davis Gas Stove Company, Ltd.), of No. 60, Oxford Street. Among the many triumphs of the modern decorator's art which Olympia contains at the present moment, there is none that can take precedence of the oak-panelled hall shown by the Nautilus Company. Design and work vie with each other in excellence; and both fully deserve the praise that one hears bestowed upon them by visitors. Briefly stated, the exhibit consists of a lounge hall panelled in oak, with a modelled plaster barrel ceiling of the James II. period. The furniture is mostly of the Jacobean period. Many charming examples of antique tapestry and needlework are displayed; and a feature of the room is the set of carved wood and gilt gas-fittings, designed from an old Charles II. candelabra. Another noticeable feature is the Jacobean gas-fire with dogs specially designed for use in oak-panelled rooms of this period. The whole of the woodwork and plaster work was designed and executed by the Architectural Department of the Nautilus Fire Company.

There were, however, other matters besides these beautiful things with which the writer had to concern himself. In the "JOURNAL" for July 29 last [p. 241], there was an article by Major F. Cornelius Wheeler, the Manager of the Architectural Decorations Department of the Nautilus Company, on the lines of the paper which he read at the Edinburgh conference of the British Commercial Gas Association. It will be remembered that he showed there what substantial economy in space and money could be secured by substituting for coal-fires gas-fires with specially designed gas-flues in place of the ordinary coal-chimneys. For consideration in connection with national housing schemes, it is stated that £30 per cottage can be saved by using the "Nautilus" cast concrete gas-fire flue. With the initial adoption of gas for all apartments where only intermittent heating is ordinarily required, and the use of the "Nautilus" small gas-flues in the thickness of the walling, great structural economies are effected by the elimination of foundation concrete, brick footings, projecting chimney-breasts, trimmers, skew-back arches, concrete hearths, and large brick chimney stacks; and the proportion of wages, and other costs, incidental to coal flue construction are in this way saved. Further, a considerable gain in floor space and cubic contents is obtained.

The system now advocated has been evolved by the aid of several months' careful tests and experiments. The practical nature of the system is exemplified by a full-sized section of a house erected on the principles advanced, and available (at the Nautilus show-rooms) for the inspection of all who are interested in economy in housing schemes. Samples of the blocks used are also to be seen at the exhibition. These hollow concrete blocks are of such a width that they can, for making a flue, be built up in, so as to form part of, even a half-brick (4½ in.) wall. The adoption of the system is a matter of importance which is rightly being impressed upon architects.

The Davis Company's Gas Appliances.

Outside the Nautilus Company's lounge hall, the Davis Gas-Stove Company, Ltd., have fitted up an all-gas kitchen installation. There is a cooker here possessing features which appeal to users—the oven raised well off the ground, and the hot plate fitted at the side. Near by is a Davis "Burn All" domestic refuse destructor, which is an extremely useful adjunct to the gas-cooker. It is very small, and very simple, but at the same time well able to meet any demands that may be made upon it. Then there is a hot-plate, with one part of the top solid (for cooking in porcelain vessels), and having a movable burner, jointed so that it can be placed in any desired position. A gas-heated circulator and 20-gallon tank side by side with a coke-boiler draw attention to two efficient methods of water heating. On the other side of the kitchen, over the sink, is an "Oxford" sealed-type water-heater, designed to supply small quantities of hot water. There is a ball valve, so that the water never has to be turned on; and the gas-flame is regulated by a thermostatic valve.

Another room is fitted up as a bathroom, provided with an "N.H." built-in fire, which has been specially designed for use in connection with national housing schemes. It has the Davis Company's best burner, and they are going to supply it at the price of the ordinary 10-in. fire, so as to compare favourably with what the builder has been in the habit of putting in. Over the bath is a Davis "Shamrock" sealed type geyser, with detachable interior, arranged for either right or left hand fitting. The water cannot come into contact with the combustion gases. Over a basin is a "Midget" apparatus, for supplying practically instantaneously small quantities of hot water.

R. & A. Main, Ltd.

Messrs. R. & A. Main, Ltd., of Edmonton, exhibit domestic heating and cooking apparatus, including specially designed appliances for use in connection with housing schemes, gas-cookers, grillers, and boiling-rings, gas-heated wash-boilers, water heaters, and radiators, and artistic and hygienic gas-fires of various types, suitable for drawing-rooms, dining-rooms, bedrooms, and offices. There are the "Elite" gas interior, and also the "Entente" gas-fire, which are new productions. The latter is what is known as the inset type of fire, and is designed to fit into and become an integral part of the coal grate. It blends harmoniously with the most artistic setting, and effectively provides all the convenience of hygienic gas heating, with the minimum of trouble and expense. Besides, it does not restrict the normal ventilation of the room. Street-lanterns and slot gas-meters represent the Glover side of this house.

The "Stella" Gas-Fire.

Part of the exhibit of the Carron Company, of No. 15, Upper Thames Street, E.C., consists of a series of their "Stella" gas-fires, in different finishes, and designed to be absolutely silent in action. There is a double row of fuel, the object of which is to retain more of the heat; and a special regulating valve is provided, by which the consumption of gas can be reduced 10 c.ft. per hour. That is to say, a fire may start with a consumption at the rate of 40 c.ft. of gas per hour; and when the fuel gets thoroughly heated, this can be reduced to 30 c.ft. The parts of the fire are easily get-at-able, when requiring attention.

Potterton's Water-Heating Apparatus.

The chief feature of the stand of Mr. Thomas Potterton, of Ravenswood Road, Balham, S.W., is an example of an all-gas kitchen—combining a "Victor" boiler for the hot-water supply, a cooker for ordinary requirements, and a gas-fire for the warming of the kitchen during cold weather. The hot water part of the equipment consists of a No. 19 boiler, with a jacketed hot-water storage cylinder, provided with thermostatic control and cut-out valve. Demonstration is given with the apparatus, showing that hot water at a high temperature for baths or culinary purposes can be obtained at a minimum cost for fuel and with the utmost convenience in action. The cost of a warm bath, based upon current London gas prices, varies from 1½d. to 2d., according to the volume of water required.

A prominent item in the equipment of the stand is a new design of complete boiler and storage apparatus for all kinds of houses, flats, and other similar needs. It is specially adapted to housing schemes—being designed with a view to compactness and general utility. The apparatus is made in two or three different varieties—one being arranged particularly to be accommodated in narrow spaces, with the connections entirely on the front of the apparatus, so that they do not increase the width. This should prove extremely useful for flats, and other places where space is limited.

The standard varieties of "Victor" apparatus are designed to produce water at 150° Fahr. or thereabouts, according to the initial temperature of the cold water; and this is suitable for all ordinary household requirements, including the scullery sink, where, of course, the removal of grease, &c., necessitates water at such a temperature. There are some instances, however, in which the water is not required above 100° or 110°—such as the bacon-washing premises, school play-rooms, &c.; and to meet these cases Mr. Potterton has designed a special form of apparatus, so arranged that the water in the cylinder is heated in bulk and does not exceed the required temperature. The provision for this maximum temperature avoids the necessity for any dual valves, economizes in the gas consumed, and much simplifies the installation of the plant. A large number of premises in London alone have been fitted with this apparatus for the washing of bacon previous to the smoking of it; and the result has been repeat orders.

The Potterton display also includes a complete installation of low-pressure hot-water heating with radiators in circulation from a No. 20 "Victor" gas-boiler having automatic controls by means of a special form of thermostat operated by the temperature of the atmosphere. In this way, the utmost economy is attained, as

it is quite impossible for the gas to burn in excess of the requirements—the thermostat being so regulated that immediately the desired temperature is reached the consumption is retarded accordingly. This arrangement should prove very useful for the heating of offices and other buildings where the requirements are intermittent; and as it eliminates all suggestions of products within the room, the system should meet with the hearty approval of medical men.

An example of the equipment of a large house or hotel is provided by a twin boiler installation and a 50-gallon hot-water cylinder to act in conjunction with the kitchen range that might be in use. The output of the three boilers would represent 100 gallons per hour of high-temperature water, averaging 150°. The Potterton apparatus is specially adapted to the requirements of restaurants and kitchens where a large and varying demand for hot water occurs, as by the adoption of boilers in battery form and the provision of the automatic control, the greatest flexibility in working is attained, without any individual attention being required. This is of direct assistance to the staff, and likewise to the management, as it renders the running of such establishments, in respect of their water supply, a very simple proposition.

As a side-line to the exhibit, there are some nickel-plated towel-rails, and other like adjuncts to modern house equipment.

The firm have had a new brochure written for distribution at the exhibition, with a view to interesting the general public in the advantages of gas-heated hot-water supply, and to impress upon those concerned with the fixing the lines on which they should carry out the installing and other work appertaining thereto in an economical and practical form.

"Stimex" Specialities.

The Stimex Gas-Stove Company, Ltd., of Balham Hill, S.W., are patentees and manufacturers of gas cookers, ranges, &c. One of the principal features of "Stimex" cookers and ranges is that the bottom is entirely closed; the burners being placed in an independent chamber at the side. This arrangement is claimed to result in a saving of 60 p.ct. in oven gas consumption. The cookers are made in many sizes, and varying patterns to suit all classes; while to meet the new requirements in connection with national housing schemes, the firm have designed a special series (giving quite unique hot-water facilities), under the name of the "Municipal" combination series. There is a new patent automatic device, which enables the first 5 gallons of hot water to be brought up to scalding temperature, without the necessity of heating more water than is actually required. In the "Stimex" gas-cooker No. 3 size, when the oven has once been brought up to cooking temperature, the correct heat can be maintained with a gas consumption of only 11 c.ft. per hour; the actual cost of gas, with this cooker, working out at less than ¾d. an hour, with gas selling at 4s. 8d. per 1000 c.ft. The "Municipal" series are of various forms in order to meet the needs of local authorities. Among the many advantages claimed for the Company's cookers are that there are no burners in the oven, though the hot air passes through; smells and "smoky" ovens are prevented; dirt and dust cannot be drawn on to food, because the bottom of the oven is entirely closed; the temperature in the oven is not lowered by a sudden draught when an outside door is opened; a hot chamber, without burners inside, is provided for warming plates, &c.; the juices of meat are retained to a remarkable extent, and the shrinkage is far less. The firm are also the manufacturers of several types of "Stimex" gas circulators; the principal point of these being low gas consumption, rapid heating, and ease of cleaning both gas flues and boilers.

Ajax Water Heaters.

Among water-heating appliances, Ajax Heaters, Ltd., of Derby Avenue, Nether Street, North Finchley, show Freeman's patent geyser (the "Ajax"), which is an interchangeable machine, and can be taken apart in one minute by just undoing a union above the water-tap, when the whole thing can be taken to pieces, interior and exterior. The heater can be adapted to any position, the base being movable, so that it is not necessary to stipulate whether a left or right hand machine is required. It is made in three sizes; and the firm's great feature is a machine in aluminium throughout. There is to be seen on the stand an "Ajax" geyser with the cover off and the interior made of glass, so that the whole process can be witnessed.

Falkirk Iron Company.

The Falkirk Iron Company, Ltd., of Craven House, Kingsway, have two exhibits of special interest to "JOURNAL" readers. The first one is the "Twin" boiler system, which is a circulating cylinder and washing copper combined. The copper is provided with an outer cylinder or water jacket, which contains 10 gallons of water for bathing or washing-up, and is connected with the boiler at the back of the kitchen-range or living-room grate. In this way, hot water is obtained which, in turn, heats by convection the water in the central boiler, which has a capacity of 8 gallons. Should the coal-fire not be in use, there is a gas-burner which can be lighted and will give the same results; so that it can be used as an independent unit.

The Company's "Lawson" gas-heater is an apparatus of the portable type, which may be used in any room in the house, by simply connecting it up to the gas supply with a flexible tube. There is an inner combustion chamber which gets red hot in about three minutes from the time of lighting; and the gas consumption is said to be very small. The bunsen burner and the arrangement of the apparatus generally is designed to ensure complete combustion of the gas.

"Solignum" Wood Preserving Stain.

"Solignum" is a wood preserving stain derived from coal tar, and is manufactured by Messrs. Major & Co., Ltd., of Hull, and No. 12, Norfolk Street, W.C. It is made in two kinds—for interior and exterior work—and in a number of different colours and shades, suitable for panels, walls, floors, &c. It is said to be a complete protection against dry and damp rot, and to destroy all insects and fungus growths. In fact, it is used extensively in many tropical countries, as a protection against the white ant. "Solignum," it is explained, is similar in some respects to creosote, but is not variable. That is to say, it contains always a definite proportion of tar acids, which is an advantage. It is claimed that it preserves timber generally about three times as long as creosote, while it has at the same time a greater covering capacity.

Some Other Exhibits.

There are quite a number of other stands on which the use of gas is demonstrated in one form or another. In this connection, mention may be made of the following exhibits, though, in view of the very large number of things on view, it is quite possible the list may not be a complete one.

Messrs. Ewart & Son, Ltd., of Euston Road, show a large number of their geysers, &c.; and a special feature is made of the "Industria" water-heater, a new gravity heater which has been introduced in order to meet the demand for inexpensive water-heaters for new housing schemes requiring hot water to bath and sink on the same floor. It is so arranged that, while the main part of the heater contains 15 gallons, and requires about 25 minutes to heat sufficient water for a bath, a small subsidiary boiler is fitted that will heat about 1 gallon to practically boiling-point in about 5 minutes. The cost of installation is small.

The "Duck" oven (a portable stove which is operated by a single gas-ring) and the new model "Chilli" portable gas-radiator are shown by Messrs. J. Glover & Sons, Ltd., of Wandsworth. The Interoven Stove Company, Ltd., of No. 156, Charing Cross Road, show a gas-cooker which is convertible in a few seconds into a wash-copper—the hot-plate being usable, if desired, while the wash-boiler is in its place in the oven, with a heat-retainer in position over the top. When the oven is required to be used as an oven, the hot-plate is raised, and the wash-copper removed. The London Warming and Ventilating Company, of Newman Street, W., exhibit their "Wifesjoie" one-ring gas-cooker.

Messrs. M'Dowall, Steven, & Co., of Upper Thames Street, show the "Combyn" coal and gas fire (the latter being hinged, so that it can be swung into recesses at the side when the use of the coal grate is desired), as well as other cooking and heating specialities. On the stand of the Martin Engineering Company, Limited, of No. 49, Theobald's Road, W.C., are to be seen the "Express" boiler and the "Express" water-heater—a self-contained water-heater, cylinder, and feed cistern, which is constructed to enable the interior to be readily cleaned without dismantling the heater. The gas can be automatically shut off at any temperature. Multicooker Inventions, Ltd., of Berners Street, W., draw attention to the latest models of the original "Multicooker;" and the Patents Mart and Trade Agency, of Bank Chambers, W.C., to their "Colwell" gas-heater—a portable appliance, weighing only a few pounds, and consuming 8 c.ft. of gas per hour.

The "Thermecon" gas-burner attached to a wash-boiler is displayed by Messrs. Rowell and Sons, of Byron Street Works, Newcastle-upon-Tyne. It is claimed that this burns well and without trouble under varying conditions of gas supply—heats the water rapidly when full on, and can then be turned down to just the right size of flame to maintain the water at an even temperature. It gives flame-contact over the under-surface of the copper at all pressures. There is also the "Thermecon" gas-ring, with high-velocity bunsen tube. This gas-ring, it is pointed out, gives flame-contact without any adjusting or regulating.

The "Supreme" water-boilers and heaters made by Messrs. F. J. Shenton and Co., Ltd., Nos. 68 and 69, Shoe Lane, E.C., are shown in six sizes. The cold water enters and flows through a hollow base, thence by way of a short connection on the opposite side into the double case of the heater to a hollow ball at the top, and through a copper coil to the outlet. The gas is delivered by a plain injector into a tube where it is mixed with sufficient air to ensure complete combustion, so that no flue is provided. There are over 30 ft. of copper coil contained within the hollow case, so that a large heating surface is exposed. The condensation formed runs off by a small outlet at the bottom.

The Manager to the Gas Committee of the Glasgow Town Council has recently submitted proposals regarding the chemical works at Dalmarnock, Dawsholm, and Tradeston, for carrying on the making of sulphate of ammonia and the crude distillation of tar. He suggested the transference of the crude oils containing naphtha and carbolic acid to the Provan chemical works, and also recommended the making of refined products which necessitated the erection of a carbolic acid extraction and a benzol refining plant. The Committee authorized the Manager to prepare drawings and specifications, and obtain tenders for approximately one-half of the plant specified. Additional plant to complete the scheme will be installed when required.

OXIDE PURIFICATION:

EXAMINATION OF MIXTURES OF FERROUS AND FERRIC SULPHIDES AND FREE SULPHUR.

By GEORGE WEYMAN, M.Sc., A.I.C.

THE similarity of ferrous and ferric sulphides, and the ease with which both oxidize to hydrate and free sulphur, makes their separation or estimation a matter of difficulty. In dealing with the sulphides derived from the action of hydrogen sulphide on ferric hydrate, it is of importance to know whether ferrous or ferric sulphide has been obtained. In such a case, the ferrous sulphide will have been formed, with liberation of sulphur:

$$Fe_2O_3 + 3H_2S = 2FeS + S + 3H_2O$$

while the ferric sulphide will only be accompanied by water:

$$Fe_2O_3 + 3H_2S = Fe_2S_3 + 3H_2O.$$

The free sulphur accompanying the formation of ferrous sulphide has usually been taken as a criterion of the amount of the latter formed; and it has usually been extracted by carbon disulphide, and so estimated. Free sulphur, however, may be formed in many other ways—for example by oxidation of either of the sulphides. Carbon disulphide is itself a sulphur compound somewhat prone to decomposition. On the other hand, sulphur may disappear by volatilization in the presence of water, by the formation of disulphide, and in other ways. Lewis T. Wright, while using this method of procedure, suggested that in further work copper sulphate or silver nitrate might be used. The former reagent has been used by me successfully for determining the ratio of sulphur to iron. The method consists in decomposing the sulphides with copper sulphate solution, whereby the same copper sulphide, CuS, results from both ferrous and ferric sulphides. The latter, containing more sulphur, gives more copper sulphide. The iron which passes into solution may be estimated, and the copper determined in the residual copper sulphide. From these data, one may obtain the sulphur equivalent of the copper, and also know the amount of iron which was in combination with the sulphur. Comparison of the ratio with the theoretical ratio for Fe_2S_3 and FeS shows whether the substance taken was either of these compounds or a mixture of them.

The details of the method as used are as follows: The sulphide (possibly containing unaltered ferric hydrate) is freed from any entangled hydrogen sulphide by a current of hydrogen, and then thrown into an excess of copper sulphate solution. The mixture is digested for ten minutes at 30° to 40° C., and rapidly filtered and washed. The washing is carried out so as to keep the filter paper full of liquid. After washing, the wet copper sulphide is thrown into the original beaker with concentrated nitric acid and oxidized. It is then diluted; ammonia added in excess; and the iron filtered off. The precipitate is purified from copper by re-solution and precipitation, and the washings added to the main bulk. The latter is then acidified with nitric acid and a little sulphuric acid made up to a known bulk, and a portion taken for electrolysis. The filtrate from the copper sulphide which contains the excess of copper sulphate, together with the iron which has been combined as sulphide, is made strongly alkaline, and the ferric hydrate filtered off. The precipitate is purified in the usual way by re-solution and re-precipitation, and is then dissolved in sulphuric acid; made up to a known bulk; and portions taken for reduction and titration with permanganate. The reduction is best carried out with a modified Jones Reductor, as any traces of copper are then eliminated by the filter pad.

It is essential, in analyzing the sulphide from the action of hydrogen sulphide on oxide of iron, that the oxide should be given several hours in the presence of an excess of hydrogen sulphide, so that it is completely sulphided. Any inactive oxide left is not affected by the copper sulphate, and does not pass into solution. If required, this latter may be estimated.

As an example of the use of this method, the following figures may here be quoted: (1) According to Gedel, by dropping ferric chloride into an excess of ammonium sulphide, ferric sulphide results. When 0·1312 gram of iron as ferric chloride was taken and dropped into an excess of ammonium sulphide, and the iron sulphide washed and thrown into the copper sulphate (as outlined above), the sulphur equivalent of the copper found was 0·1098 gram. By calculation, 0·1312 gram of iron should combine with 0·1129 gram of sulphur to form ferric sulphide, and with 0·07533 gram to form ferrous sulphide. There is here no doubt that Gedel's method of preparing ferric sulphide gives the pure compound. (2) When ammonium sulphide is dropped into ferric chloride solution, the iron is reduced; and ultimately ferrous sulphide and free sulphur are formed. For example, 0·1312 gram of iron was used in this way to form ferrous sulphide, and the resulting precipitate (after washing) was thrown into copper sulphate solution as above. The sulphur equivalent of the copper found was 0·07685 gram. The 0·1312 gram of iron taken should have given 0·07533 gram of sulphur as ferrous sulphide.

Experience has shown that the method gives a good indication of the relative proportions of ferrous and ferric sulphides formed in admixture. Ferrous disulphide is not affected by warm copper sulphate.

It is also interesting to note that the physical appearance of the two sulphides precipitated from solution present considerable differences. Ferric sulphide is light and flocculent, and similar (except for colour) to ferric hydrate precipitated under similar conditions. The ferrous sulphide is dense, and consists of fine particles which pass through coarse filter paper.

PERSONAL.

Several changes are taking place at Leeds consequent upon Mr. H. H. Collett, the Manager of the Meadow Lane works of the Corporation Gas Department, being appointed Chief Engineer to the Danish Gas Company. Mr. Collett will be succeeded at Meadow Lane by Mr. P. H. WHEELER, of the York Street works, Leeds. Mr. C. P. TOOLEY, at present Assistant Manager at the New Wortley works, will become Manager at York Street; and Mr. Tooley's old place will then be taken by Mr. HAROLD SHEWRING, Assistant Manager at Meadow Lane.

Mr. H. G. RITCHIE, Gas Engineer and Manager at Irvine, Ayrshire, has been appointed by the Falkirk Town Council to succeed Mr. G. P. Mitchell as Engineer and Manager of their gas undertaking, Mr. Mitchell having been appointed to Blackburn. The salary is £500. Mr. Ritchie was trained at Kirkcaldy, and later he went to Fraserburgh, as Manager to the Gas Company there. There he remained for over four years, when he received a similar appointment to Irvine, at the end of 1912. Among other improvements at Irvine, Mr. Ritchie has erected vertical retorts, new boilers, tar-extractors, and station-governors. Under his supervision, the gas manufactured has risen from 39 to 53½ millions.

Mr. MATT DUNN, on his retirement from the position of Gas Engineer and Manager of the Stockton-on-Tees Corporation, has been presented with a gold watch by the employees, with a silver coffee-pot for Mrs. Dunn. Mr. G. Stainsby, who made the presentation, said Mr. Dunn had endeared himself to all by his fair-minded treatment. The newly-appointed Manager, Mr. W. W. Atley, was present, and wished Mr. and Mrs. Dunn long life and prosperity.

Mr. T. FINDLAY has been appointed Manager of the Banff Gas Company. He is at present at the Gorebridge Gas-Works.

Mr. HERBERT BANYARD, Gas Manager to the Haverhill Urban District Council, has been appointed Engineer and Manager to the Sittingbourne District Gas Company. He thus goes from a 23 million to a 73 million c.ft. per annum works.

Mr. SYDNEY O. STEPHENSON, the Engineer and Secretary of the Worthing Gas Company, is first "M.E.Z." of a new Chapter of Royal Arch Masons, which was consecrated at the Connaught Hall, Worthing, on the 29th ult.

The Board of Trade are at present responsible for the organization of the Coal Mines Department, which is attached to, but does not form part of, the Board of Trade; and the President has arranged that Mr. W. C. BRIDGEMAN, M.P., Parliamentary Secretary to the Board of Trade, shall act on his behalf in all matters relating to coal, subject to the authorization of the President, on questions calling for his decision. Mr. A. R. DUNCAN is Coal Controller; and the principal sections of the Coal Mines Department under the Controller are production, trade, finance, household fuel and lighting, and secretariat.

Cleaning Gas by Electrical Precipitation.

An electrical precipitation process for cleaning blast-furnace gas, which has been installed at the works of the American Manganese Manufacturing Company, was described by Messrs. N. H. Gellert and K. V. Laird in a paper at the Engineers' Club, Philadelphia. The installation, which is an adaption to blast-furnace gas of the Cottrell electrical precipitation process, cleans from 45,000 to 50,000 c.ft. of gas per minute. Previously, four to six men were constantly employed cleaning the stove-wells and combustion chambers and boilers of their dust burden. The dust that was discharged into the stoves very often formed into large masses the size of small boulders, and could not be removed from the stoves before being broken-up. After the precipitators were started in operation, the men were taken off the job, and for weeks at a time not one single man was needed to clean any of the material from the stoves and boilers, because of the entire absence of any dust deposits. While the primary purpose of a precipitator is not to collect potash, the potash content of the dust, when the ores contain any appreciable amount of potash, makes this a valuable bye-product; while the operating expenses are slight compared with any other system of cleaning. At the works referred to, the potash content of the dust has been from 7 to 9 p.ct. on pig iron. The results of the cleaning, by actual measurement, have demonstrated that the electrical precipitation plant can clean gas to less than one-tenth of a grain of dust per cubic foot of gas. This figure is expected to be the maximum amount of dust remaining in the gas. The cleaning has been found to have been carried to 0·06 grain of dust per cubic foot of gas.

The subject of "Gas Manufacture" is to be dealt with by Mr. F. E. Henman at a meeting next Friday evening of the Junior Institution of Engineers.

COKE-OVEN GAS FOR SHEFFIELD.

Adjourned Discussion on Mr. Laverick's Paper.

THE paper, on the supply of coke-oven gas to Sheffield, read by Mr. J. H. W. Laverick, of the Tinsley Park Colliery, before the November meeting of the Midland Institute of Mining, Civil, and Mechanical Engineers [see "JOURNAL" for Nov. 18, p. 371], was further discussed at last Thursday's meeting at Leeds.

Mr. LAVERICK, in some supplementary notes, said he found that during the complete year at Tinsley Park there was supplied 374½ million c.ft. of gas. The period included several weeks of strike; otherwise the quantity would have been over 400 millions. This was more than the total quantity of gas required for a town of the size of Rotherham. The total quantity of gas produced in South and West Yorkshire amounted roughly to 17,000 million c.ft. per annum. If the gas from the regenerative ovens already in work supplied gas to the towns, this source of supply would be only 2000 million c.ft. of the total 17,000 millions required. It was evident, therefore, that the existing coke-oven plants could go a long way towards supplying all the South and West Yorkshire towns and villages. Much had been heard of super-electricity stations; and it might be asked why not super coke-oven gas plants, particularly in the immediate neighbourhood of suitable coal supplies? He estimated that nine such super-coking plants could take the place of the thirty-four or thirty-five existing smaller plants. But in his opinion it was better to continue the use of the latter local plants, in order to avoid the necessity of carrying coal the greater distances to the super-stations. In the national interest the use of gas should be extended more and more; and he knew of nothing that would help the country better to reduce its war debt, and assist in balancing the adverse rate of exchange, than the production of the largest possible quantity of coal, of which the whole world was in such urgent need, either as a raw material or in the form of its bye-products.

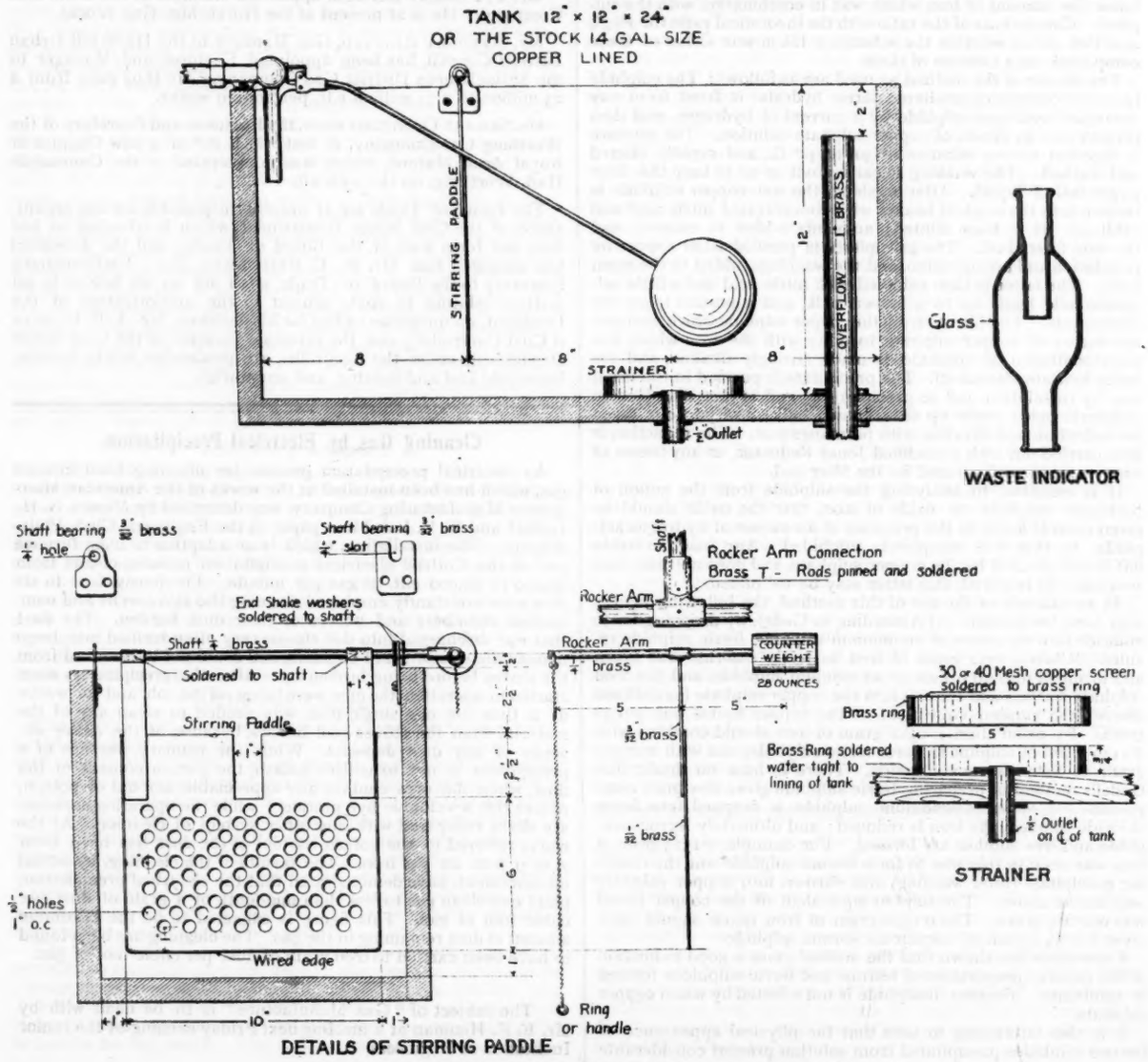
Professor O'SHEA (Sheffield University) warmly congratulated Mr. Laverick upon the success of his scheme, and upon the uniform quality of the gas he was sending from Tinsley Park to Sheffield, which was quite equal to, and often better than, any other supply available to Sheffield consumers. It was convincing evidence of the suitability of coke-oven gas for domestic as well as industrial use.

Prof. W. G. FEARNSIDE (Sheffield University) also heartily congratulated Mr. Laverick, and emphasized the necessity of economizing the supplies of coal suitable for coking, as he estimated the total of these in Great Britain would only last about 120 years, although there was possibly a 500 years' supply of engine coal. The resources of coking coal, however, at the present rate of consumption represented only between 10 and 20 million tons of steel. Steam power was at the present time the cheapest means of producing power; and to carbonize the coal and utilize the gas for the production of power would represent only four times the consumption of coal for the equivalent electric power.

Mr. LAVERICK, in reply to a question, said the secret of the uniformity of the gas produced at Tinsley Park colliery was the use of the right type of oven, and having the oven walls in first-class condition. In reply to further discussion as to the relative costs of transmitting power, he quoted the conclusions of an expert, that gas could be sent from the Yorkshire coalfield to London, and transformed into electric energy more economically than electric current could ever be transmitted to London from pit-head generators.

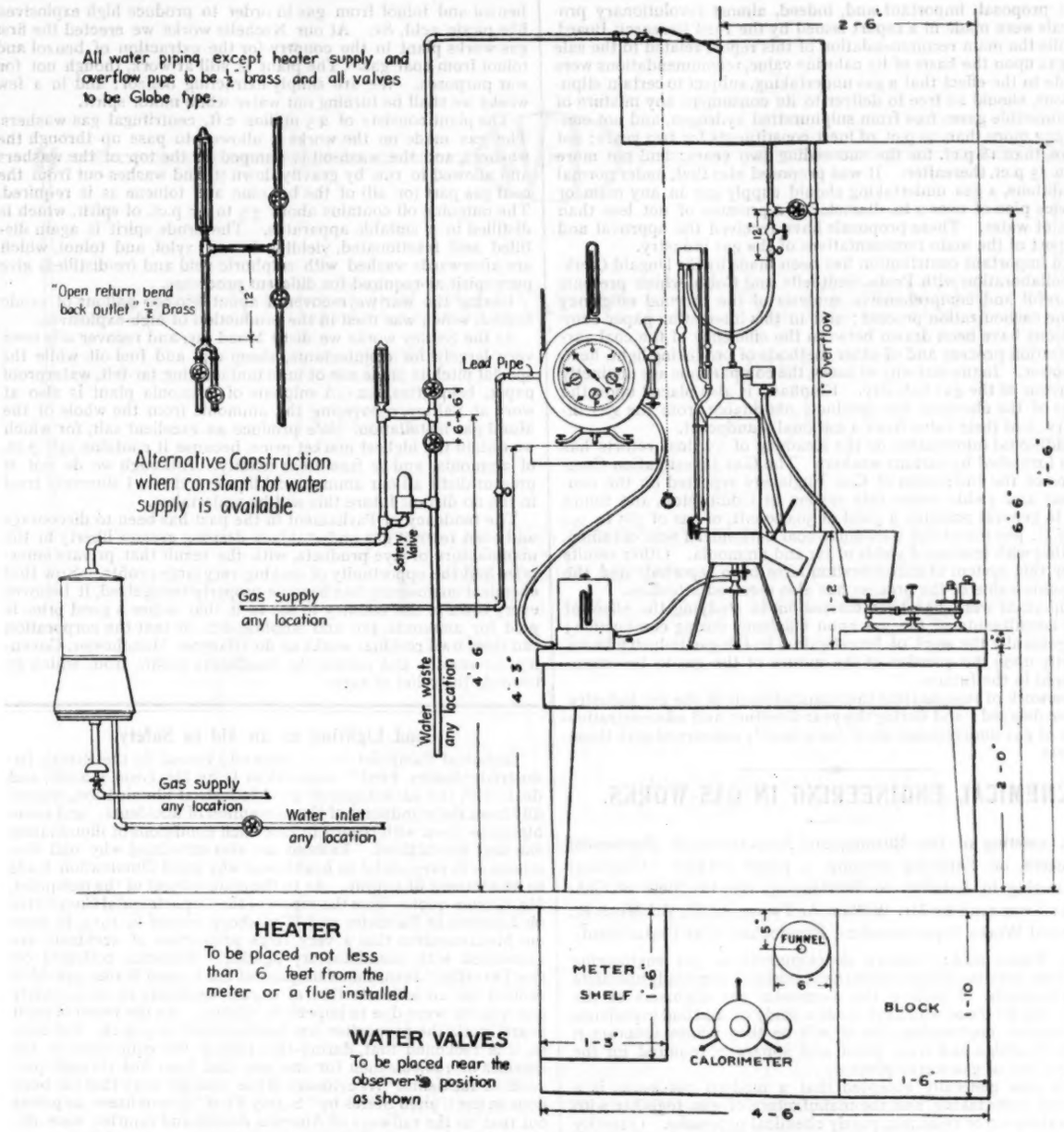
AMERICAN CALORIMETER INSTALLATION.

WE have received from Mr. Charles D. Jenkins, of the Gas Inspection Division of the Commonwealth of Massachusetts Board of Gas and Electric Light Commissioners, prints showing the standard form of calorimeter installation which was adopted in November last by the Department of Public Utilities, State House, Boston, U.S.A.



DETAILS OF STIRRING PADDLE

AMERICAN STANDARD CALORIMETER INSTALLATION—DETAILS.



AMERICAN STANDARD CALORIMETER INSTALLATION—ARRANGEMENT DIAGRAM.

PROGRESS IN CHEMICAL INDUSTRY IN 1919.

In continuance of their policy of keeping chemists and allied technologists supplied with up-to-date and authentic information, the Council of the Society of Chemical Industry have decided to publish a fourth volume of their "Annual Reports on the Progress of Applied Chemistry," covering the year 1919. The reports take the form of monographs written by acknowledged experts in the various branches of chemical technology. The method of treatment is two-fold in character. In the first place, the writers aim at presenting an accurate and reasonably complete, objective account of progress achieved; and, in the second, they seek to present a well-balanced survey, throwing the events they record into proper perspective, and, where occasion requires, interpreting them in the light of their individual experience. Volume IV., it is hoped, will be published during the month of March. Some of the subjects treated, and the respective contributors, are: "Plant and Machinery," by W. B. Davidson, M.A., D.Sc., Ph.D., F.I.C. "Fuel," by J. T. Dunn, D.Sc., F.I.C. "Gas and Destructive Distillation," by E. V. Evans, M.B.E., F.I.C.

As a preliminary to the issue of the new volume, it was thought that the immediate publication in the Society's "Journal" of short summaries of some sections dealt with might be of interest as well as utility. These epitomes are necessarily of a somewhat sketchy character, and can in no way be regarded as substitutes for the full accounts; but it is felt that they should serve to give the reader a very general, preliminary bird's-eye view of progress made, and add interest to the subsequent study of the reports themselves. The short articles published have been contributed by the authors of the reports; the following dealing with

THE GAS INDUSTRY.

While the gas industry has played an all-important *rôle* in aiding the nation to carry out its main responsibility during the years of war, it has itself suffered by virtue of the shortage of raw material and men. Not only has progress been greatly retarded, but even the maintenance and renewal of plant and apparatus have been markedly inadequate. Signs are evident that the lines on which reconstruction in the gas industry is to be carried out are fundamentally sound. But many difficulties are encountered in carrying into effect such schemes of reorganization; and to these the labour question and the shortage of material are in no way unimportant contributors.

The question of primary importance to the gas industry at the present moment relates to the nature of the gas which, in the best interests of the consumer and manufacturer, should be distributed. This is an intricate and involved problem, and one on which there is naturally diversity of opinion. The experimental work recently undertaken at the University of Leeds (at the instigation of the Institution of Gas Engineers) affords some useful evidence towards the elucidation of the problem; and particularly valuable is the general conclusion arrived at from these investigations—namely, that the value of gas to the consumer is approximately proportional to its calorific value.

Following the enunciation of this principle, one of the London gas companies published a scheme showing that gas could be sold upon a calorific basis, rather than by volume. Shortly following

this proposal, important and, indeed, almost revolutionary proposals were made in a report issued by the Fuel Research Board. While the main recommendation of this report related to the sale of gas upon the basis of its calorific value, recommendations were made to the effect that a gas undertaking, subject to certain stipulations, should be free to deliver to its consumers any mixture of combustible gases free from sulphuretted hydrogen, and not containing more than 20 p.ct. of inert constituents for two years; not more than 18 p.ct. for the succeeding two years; and not more than 15 p.ct. thereafter. It was proposed also that, under normal conditions, a gas undertaking should supply gas in any main or service pipe of over 2 in. diameter at a pressure of not less than 2 in. of water. These proposals have received the approval and support of the main representatives of the gas industry.

An important contribution has been made by Sir Dugald Clerk, in collaboration with Profs. Smithells and Cobb, which presents a careful and comprehensive analysis of the thermal efficiency of the carbonization process; and in this interesting paper comparisons have been drawn between the efficiency of the coal carbonization process and of other methods of producing light, heat, or power. In the majority of cases, the comparisons are distinctly in favour of the gas industry. Emphasis is also placed upon the value of the chemical bye-products obtainable from the gas industry, and their value from a national standpoint.

Additional information on the steaming of vertical retorts has been furnished by various workers. The Gas Investigation Committee of the Institution of Gas Engineers reported on the conditions and yields under this system at Uddingston, and found that in general practice a yield of 30,000 c.ft. of gas of 385 to 394 B.Th.U. per ton of the particular coal carbonized was obtained, together with increased yields of tar and ammonia. Other results under this system of carbonization have been reported; and the economic value of the process has also received attention.

Important work has been carried out in studying the effect of inert constituents of the gas upon efficiency during combustion; and generally the work of investigation in the gas industry bears directly upon the question of the nature of the gas to be manufactured in the future.

The work of reorganizing the financial basis of the gas industry is over-delayed; and during the year directors and administrative staffs of gas undertakings have been largely concerned with these matters.

CHEMICAL ENGINEERING IN GAS-WORKS.

AT a meeting of the Birmingham Association of Mechanical Engineers, on Saturday evening, a paper entitled "Chemical Engineering in Relation to Working-up Bye-Products of Gas-Works" was read by Mr. William A. Twine, A.I.C., A.I.Mech.E., Chemical Works Superintendent, Birmingham Gas Department.

Mr. Twine said: Modern developments in gas engineering have been very largely pioneered by scientists—especially chemists and physicists. I believe the successful gas engineers of the future will be those who have made a study of, and had experience in, chemical engineering; for it will be they whose function it will be to design and erect plant and apparatus required for the carrying out of gas-works process.

It is now generally accepted that a modern gas-works is a chemical undertaking, and the manufacture of gas, together with the working-up of residuals, purely chemical processes. Quantity and quality of gas made, purification, recovery, distillation of ammonia and tar (with cyanogen extraction), all call for scientific control; and surely the chemical engineer is the man who is best suited to answer the call, for he will have been trained in such subjects as the transportation of solids, liquids, and gases, filtration, sedimentation, desiccation, extraction, distillation, evaporation, crystallization, condensation, cooling and scrubbing of gases, refining of solids, and concentration. As a young man he will have received a chemical and physical training, and afterwards he will have spent a year or two in the shops and on different plants and processes.

In Birmingham we have the largest gas undertaking outside London; and it is generally recognized throughout the world that the Birmingham Gas Department is always out for progress. There is no corporation or company that can surpass us; while very few in the world can equal us for scientific control, whether it be mechanical, electrical, chemical, or even office organization. At present we do not work-up all our own residuals; but we do make sulphate of ammonia, distil tar from the Mond gas plant, prepare tar for road-spraying purposes, and last year about 300 miles of roads were successfully treated with the material. We also extract cyanogen from our gas; and for this purpose the Corporation have the largest Williams extracting process in the world. It consists of a set of six cast-iron boxes, each 25 ft. sq. by 6 ft. deep, fitted with shelves on which hard spent oxide is laid in different graded layers. The gas, after all the tar has been removed, passes-up through these boxes, and is moistened with water vapour. This extracts certain quantities of ammonia and sulphuretted hydrogen, forming ammonium sulphide and polysulphide, which in turn combines with the cyanogen in the gas to form ammonium sulphocyanide, which is a valuable source of supply to the cyanide industry in the extraction of gold from its ores, while it brings us some thousands of profit.

As you are all aware, during the war it was necessary to extract benzol and toluol from gas in order to produce high explosives, like picric acid, &c. At our Nechells works we erected the first gas-works plant in the country for the extraction of benzol and toluol from coal gas. The plant is still at work, though not for war purposes. We are simply extracting benzol; and in a few weeks we shall be turning out water-white motor spirit.

The plant consists of 2·5 million c.ft. centrifugal gas-washers. The gas made on the works is allowed to pass up through the washers, and the wash-oil is pumped to the top of the washers and allowed to run by gravity down it, and washes-out from the coal gas part (or all) of the benzene and toluene as is required. The outgoing oil contains about 3·5 to 4·5 p.ct. of spirit, which is distilled in a suitable apparatus. The crude spirit is again distilled and fractionated, yielding benzol, xylol, and toluol, which are afterwards washed with sulphuric acid and (re-distilled) give pure spirit as required for different processes.

During the war we recovered about 850,000 gallons of crude benzol, which was used in the production of high explosives.

At the Saltley works we distil Mond tar, and recover oils used very largely for disinfectants, sheep-dip, and fuel-oil, while the special pitch is made use of in manufacturing tar-felt, waterproof paper, briquettes, &c. A sulphate of ammonia plant is also at work at Saltley, recovering the ammonia from the whole of the Mond gas installation. We produce an excellent salt, for which we obtain the highest market price, because it contains 25·5 p.ct. of ammonia, and is free from acidity. Although we do not at present distil all our ammoniacal liquor and tar, I sincerely trust in the no distant future this will be undertaken.

The tendency of Parliament in the past has been to discourage and even restrict gas undertakings desiring greater liberty in the manufacture of bye-products, with the result that private enterprise had the opportunity of making very large profits. Now that chemical engineering has become properly recognized, it behoves every town in the country to see to it that either a good price is paid for ammonia, tar, and sulphur, &c., or that the corporation run their own residual works as do Glasgow, Manchester, Coventry, Newcastle, and others, the handsome profits from which go towards the relief of rates.

Good Lighting as an Aid to Safety.

Technical Pamphlet No. 1 (price 6d.) issued by the British Industrial "Safety First" Association is by Mr. Leon Gaster, and deals with the advantages of good industrial illumination, especially from the standpoint of the prevention of accidents; and some hints are given with regard to how such conditions of illumination can best be obtained. Reasons are also submitted why bad illumination is prejudicial to health and why good illumination leads to an increase of output. As to the main subject of the pamphlet, Mr. Gaster quotes from the report of the Departmental Committee on Lighting in Factories and Workshops, issued in 1915, to bear out his contention that a very large proportion of accidents are associated with unsatisfactory lighting. Statistics collected by the Travellers' Insurance Company of the United States, provided ground for an estimate that of 91,000 accidents in 1910, nearly one-quarter were due to imperfect lighting. As the result of eight years' work, the proportion has been reduced to 18 p.ct. But even so, it is reckoned that, during this period, the equivalent of the services of 108,000 men for one year had been lost through preventible accidents. As evidence of the valuable work that has been done in the United States by "Safety First" Committees, he points out that on the railways of America deaths and injuries were decreased by 47 p.ct. and 46 p.ct. respectively in 1916; while large industrial concerns have recorded decreases ranging from 24 to 84 p.ct. since "safety first" methods were introduced. Good work has already been done by the London "Safety First" Council in the direction of the prevention of street accidents; and by the formation of the British Industrial "Safety First" Association, this work has now been extended to the industrial field. It is proposed, in co-operation with the Illuminating Engineering Society, to initiate inquiries into accidents connected with lighting; and by systematic collection of data of a uniform basis, Mr. Gaster is confident that the proportion of accidents caused by poor lighting could be readily ascertained, and the requirements of lighting from the "safety" standpoint completely determined, with a resultant most valuable saving from every point of view. A diagram giving the distribution of costs in a typical machine shop shows the cost of lighting to be only about 1 p.ct. of the wages bill, and a still smaller fraction of the total operating costs. Gas engineers should lose no opportunity of drawing attention to their ability to provide the good lighting necessary to minimize accidents. The examples illustrated in the pamphlet are electrical.

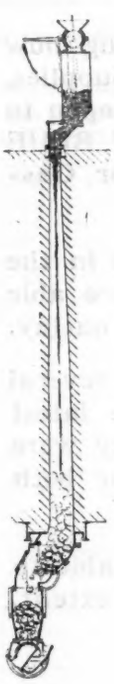
A visit of members of the Scottish Junior Gas Association (Western District) to the Pumpherston Oil Works, which had been fixed for Saturday in this week, has been postponed until March 20.

A paper, illustrated by lantern slides, on "Gas Boosting," will be read by Mr. D. Balfour Bain, Assoc.M.Inst.M.E., of the James Keith and Blackman Company, Ltd., before the London and Southern District Junior Gas Association, on Friday, the 27th inst. The meeting will start (at the Westminster Technical Institute) at 7.45. Owing to lack of accommodation, the dinner and concert have had to be postponed. The date now fixed is Saturday, April 10, at Anderton's Hotel, Fleet Street.

W-D

WOODALL-DUCKHAM VERTICAL RETORTS

FIRST IN 1903 FOREMOST IN 1920



THE W-D RETORTS ARE SUITABLE for both large and small works The unit capacities being 3, 5, or 7, tons of coal a day.

Simplicity and strength of construction, ease of regulation of heats and working, and free access to flues, retorts (both at top and bottom) and all working parts recommend the plant to Engineers and Carbonisers.

WASTE HEAT BOILERS A SPECIALITY

STEAMING: Special attention has been given to superheating the steam and the increasing of temperatures at the bottom of retorts to give the most efficient results.

For all particulars apply to

The WOODALL-DUCKHAM CO LTD
THANET HOUSE 231/2 STRAND W.C.2

Telephone 6630 CITY *Telegrams:* RETORTICAL ESTRAND : LONDON

MEMBERS :- Arthur Duckham & Co Ltd Newton Chambers & Co Ltd
T. Vale & Sons Ltd Gibbons Bros. Ltd

DIRECTORS :- Sir Arthur Duckham W. Newton Drew F. Vale
W. P. Gibbons Sir Wm Jones

WATER GAS
AND
CARBURETTED WATER GAS

MESSRS. SAML. CUTLER & SONS, LTD., having now concluded their Government Contracts for Mining Supplies, Hydrogen Producing Plants, and Munitions, are open to again undertake the construction and erection of BLUE OR CARBURETTED WATER GAS PLANTS for Gas-works and general industrial purposes.

They have a successful record of over 25 years in the design and manufacture of these Plants, and are able to provide the highest efficiency at reasonable outlay.

MESSRS. CUTLER'S Plants are fitted with several special and important Specialities, including the latest form of Safety interlocking Gear (of which they were the original Patentees) and improved devices for both production and manipulation.

They are their own Manufacturers and are thus able to control costs and deliveries to the fullest possible extent.

SAML. CUTLER & SONS, LTD.

PROVIDENCE IRONWORKS,
MILLWALL, LONDON.

39, VICTORIA STREET,
WESTMINSTER.

SPECIALISTS IN GAS-WORKS PLANT OF ALL KINDS.

No. 318

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Midland Junior Gas Association was held in the Reading Room of the Council House, Birmingham, on Saturday, Jan. 31. About forty members were present; the chair being occupied by Mr. C. C. BARBER (the President).

ALTERATION OF RULES.

The HON. SECRETARY, at the commencement of the proceedings, explained the proposed alteration of rules as affecting subscriptions and volumes of the "Joint Transactions" of English Junior Gas Associations. The following amended rule was submitted and carried by vote:

> The subscription, payable in advance on Oct. 1 of each session, shall be 12s. 6d. per annum to members over, and 10s. to members under, 21 years of age on Oct. 1 in the current session.
>
> *New Members.*—Members joining the Association before Jan. 1 in a session shall be liable for the full subscription upon election; but for those joining on or after this date, the subscription shall be 8s. 9d. to members over, and 7s. 6d. to members under, 21 years of age. The subscriptions shall include for each and every member a copy of the Junior Gas Associations "Joint Transactions."

The amended rule will take effect from Oct. 1 next.

ELECTION OF AN HON. MEMBER.

The PRESIDENT announced that the Council had elected Mr. R. J. Rogers, Fittings Superintendent to the Birmingham Gas Department, as an honorary member. Mr. Rogers was a Past-President of the Association, and had been a member since its inception.

The announcement was received with much approbation by those present.

Mr. R. J. ROGERS returned thanks for his election.

GAS SALES PROBLEMS.

Mr. ROGERS then addressed the members on the above subject.

Prior to the outbreak of war, gas undertakings in this country were gradually beginning to appreciate the necessity for establishing sales organizations to maintain existing consumptions of gas, and also to explore new fields of supply. The value of co-operative advertisement for gas was being made manifest to the industry, and much progress was, generally speaking, being made in the sales of gas for all purposes.

Many undertakings had great difficulty in supplying the large volumes of gas required for munition purposes; and the necessity for gas sales sections gradually ceased to exist. The members of such sections who were either too old or who were otherwise unfit for active service were transferred to other sections of the undertaking's activities, and instead of "pushing" the sales of gas consumers had to be asked to economize their consumption.

Notwithstanding the repeated appeals for gas economy in the national interests, the consumption of gas in many towns continued to increase, and taxed to the utmost the resources of the manufacturing plant. There was an almost entire cessation of private house building. This fact was undoubtedly a help so far as gas output was concerned at the time; and it is "up to us" now to see that the utmost possible advantage is taken to ensure that gas is installed for all possible purposes in the huge housing schemes which are now taking place all over the country.

Notwithstanding the publicity given to the use of gaseous fuel during the war, and to the national service rendered by the industry, the general public do not yet realize the enormous value the gas industry is rendering, and can render, to the community by the conservation of the fuel resources of the country. The cost of raising coal from the pits, and the difficulties and cost of both labour and transport render it necessary that the last ounce of energy and useful service shall be extracted from coal. The question is one of vital national and personal interest; and every effort should be made to acquaint every man, woman, and child with the importance of conserving our supplies of coal. This can only be done by publicity. That there is need for this is obvious to all who observe the various reports which appear in the press from time to time, in which it is suggested that the true function of coal is to be transformed into electricity, from which light, heat, and power are to be made available for the public. Sir Dugald Clerk, the President of the Institution of Gas Engineers, has clearly demonstrated on many occasions during the past twelve months the true position of the coal-gas industry and that of electricity supply in relation to fuel consumption.

One of the first essentials of any fighter is to appreciate the strength of his opponent; and we must measure as far as it is possible the extent to which electricity for lighting and power is likely to affect our sales of gas. It would be idle to argue that electricity did not possess very important advantages for lighting purposes, and that in some circumstances the electric motor was superior to the gas-engine. We can fully appreciate the advantages of electricity, and at the same time be truly optimistic of the future of the gas-supply industry. Gas holds, and will continue to hold, undisputed advantages over any other fuel for cooking, heating, and industrial fuel purposes; and provided the industry will take full opportunity of its possibilities, will perfect its national and local organizations, and encourage (by paying adequate remuneration) the right type of man to enter its ranks, we need have no qualms for the future progress and prosperity of the industry.

At the present time we are faced with many varied and difficult problems which require all the resourcefulness of our leaders to pilot us through. By the united efforts and loyal co-operation of everyone, I feel sure that we shall eventually emerge stronger and better equipped to face the future. Let us consider for a moment our position at the time of the armistice in November, 1918. The operations of the Household Fuel and Lighting Order caused gas consumers to practise the most rigid economy, and in some instances had led to the abandonment of gas-consuming appliances. The suspension of outside lighting for three or four years under D.O.R.A. not only stopped gas consumption in this direction, but necessitated a large number of lamps either being disconnected and brought into stores, or left to depreciate outside consumers' premises. In Birmingham, we had several thousand outside shop lamps out of use, in addition to 17,000 public street lamps and 4200 court lighting lamps; our gas sales staff was non-existent; gas was up in price; all gas appliances had advanced in cost with but little prospect of reduction; young men, fitters and others, were gradually coming back to their employment, having been wounded or discharged from the Army owing to some disability. Gas undertakings were carrying on by the loyal assistance of temporary staffs, both male and female. In this regard too much praise cannot be given to the women who came to the assistance of the industry.

The following shows the number of Birmingham Gas Department employees who joined H.M. Forces:

	Joined.	Killed.
Staff (all Departments)	242	24
Manual ,,	973	132
Totals	1215	156

THE TRAINING OF GAS-FITTERS.

With the signing of the armistice, the members of our various staffs rapidly began to be demobilized from the Army; and with their return commenced the consideration of the difficult problems of reorganization in all branches of our service. One of the first problems I decided to tackle was the training of the young gas-fitters who had joined the forces at the age of 18 or 19, and who had spent three or four years of what in normal circumstances is usually the best part of their training career. Unlike the clerk or commercial man, whom we are able to immediately absorb into our clerical sections pending reorganizations, the young gas-fitter (now 23 or 24 years of age) presented a more difficult problem, inasmuch as he could not be expected to prove remunerative to the department till his training had been dealt with. Upwards of 100 gas-fitters of 21 years of age and over, and approximately 90 gas-fitters' assistants joined H.M. Forces; and it was my concern for the latter number that induced me to obtain the approval of the Gas Committee to institute a scheme of training in order to fit them to efficiently carry out their duties as gas-fitters. Unfortunately, we had to close the school owing to the prevalence of naphthalene during the latter summer months and the autumn, which required all the available fitters to remove the source of consumers' complaints. We are, however, proposing to institute a series of special lectures for gas-fitters in the near future.

The usual training of gas-fitters assistants has been carried on uninterruptedly during the war; and the value of this instruction to the young gas-fitter, and its reflection in his work, is of the utmost value to the gas undertaking. This year we have co-operated with the Education Committee in sending all our youths (under 16 years of age) from the fittings department and stove repairing shops to the newly-formed day continuation classes. The youths attend for two afternoons each week—thus giving them eight hours' instruction during their working week, for which, of course, they are paid at the usual rate. This school has been inaugurated in Birmingham as a preliminary to the compulsory continuation schools which will shortly be in operation throughout the country, in accordance with the Education Act, 1918.

I have for many years laid stress on the importance of seeing that the men who instal the appliances and maintain them on consumers' premises should receive the utmost possible instruction, both of a practical and theoretical character, so far as it applies to gas-consuming apparatus.

RE-ORGANIZATION.

Having put our house in order so far as having suitably-trained men available to carry out work on consumers' premises, it was next requisite to see that our organization for the conduct of the department's business on the district was remoulded so as to meet future requirements. In reorganization, due regard must be paid in any plan to its adaptability to existing systems in a large undertaking, and to the character and the ability of the existing men to carry out the functions under the new arrangements. No gas undertaking in the future can expect to obtain the maximum results as regards output unless the sales of gas are controlled by men who possess thorough technical and commercial ability in those branches of the industry which concern the buying and selling of gas appliances, and the art of catering for the wishes and needs of the public. The measure of success and prosperity of any undertaking will largely depend on the type of man who is placed in charge of the commercial department, and upon the degree of confidence and enthusiasm which he can instil into his staff, and, consequently, in the efficiency of departments and co-operation between them.

THE TYPE OF MAN REQUIRED.

In my opinion, the gas industry has suffered greatly in the past by not only failing to pay due regard to the commercial side of its business, but by lacking appreciation of the type of man that is suited to give the best service to the public. With the exception of a few, no real effort has been made hitherto by gas undertakings to develop on up-to-date lines the sales of the gas section of their business. The time is now opportune for the full realization of the necessity for concentrating attention on this important phase of our industry by every undertaking, large or small, throughout the country. In the near future we shall be faced with new conditions—altered composition of gas, new methods of charging, and greater competition with other sources of light, heat, and power. These new conditions will demand that responsible, well-trained techical and commercial men, with wide vision, powers of organization, and possessing initiative, shall be placed at the head of concerns. It means, also, that adequate training facilities shall be available to ensure that the selling staff is properly equipped with knowledge and experience to enable them to obtain the maximum sales of gas in their area of operations.

The British Commercial Gas Association, through its Chief Officers and Committees, has done excellent work since its inception in developing the publicity and gas sales section of the industry. Their activities and efforts, however, cannot meet with the full measure of success unless it is supported by local and individual effort on the part of all gas administrators.

SALES AND FITTINGS STAFF IN BIRMINGHAM.

In pre-war days, we had in Birmingham separate staffs to deal with:

1.—Canvassing and obtaining orders, and general commercial work.

2.—For installing the appliances on consumers' premises, and taking charge of the fitters engaged on this work.

This system of separate commercial and installation sections is in fairly general use in gas undertakings, not only in this country, but also abroad—chiefly in America. While possessing obvious advantages, it has, in my opinion, disadvantages which cannot be ignored when considering the scheme which is likely to give the greatest satisfaction to consumers. In pre-war days we had our commercial representatives calling on the consumer, obtaining his order, and then passing it on to the section responsible for carrying out the work. In order to co-ordinate the work of the two sections, we had periodical conferences to discuss matters of common interest. Close attention was paid by the management to fostering *esprit-de-corps* in the section. Notwithstanding the steps taken, we occasionally received complaints from consumers that the order taken by the commercial man had not been carried out exactly as he had stated it would be done. This was due to the fact that the commercial man had no authority over issuing the order to a fitter, or supervising it. This work was left in the hands of the foreman in the fittings or installation department.

In the reorganization of the district work in Birmingham, we have divided the area of supply into smaller districts than heretofore—increasing the number of districts from eight to twelve. The representative now in charge of a district is termed the district inspector; and it is his duty to see that the interests of the department are carried out to the full. He is responsible not only for new business and canvassing, but also for the execution of the work to the satisfaction of the consumer. In order to carry out his work, the district inspector is assisted by a fittings inspector, whose duty consists mainly of inspecting premises and measuring-up for pipes and fittings required for the installation of cookers, fires, &c., and for examining work done by our own fitters and those employed by master gas-fitters.

When the coal supply and other difficulties are surmounted and we are ready to "push" for new business, it is our intention to appoint an assistant district inspector on each district to act mainly as a salesman, and a fittings foreman to supervise the work carried out on the district. The boundaries of the districts are arranged to coincide with the municipal ward boundaries; and as our rentals are also divided in a similar manner, it is an easy matter to compare the increase of consumption and other statistics of one district against another. The districts being smaller in area than those worked before the war, the district inspector should be able to work them more efficiently, and become better acquainted with the consumers of gas and the possibilities for increasing consumption.

In order to obtain an efficient sales staff, it is necessary that a proper course of training should be mapped-out, and that the utmost facilities should be given to salesmen for obtaining a thorough theoretical and practical course of salesmanship as applied to the selling of gas and appliances. We intend to train a number of young men (all of whom have been on active service during the war) as salesmen; most of them being chosen from the clerical side of the undertaking. It is essential that all candidates for the sales section shall possess the necessary qualifications for a salesman.

I recently received a deputation from our fitters, who raised objections to the salesman candidates receiving practical experience with a fitter, and expressed the opinion that all salesmen required by the gas undertakings should be from the ranks of the fitters. I could not agree with their views, and pointed out to them that, although a man might be a first-class fitter, it did not follow that he would develop into a first-class salesman. We shall require in the coming years well-trained, efficient, commercial men to represent us; and I am pleased to notice that the question of training salesmen in the gas business is now engaging the attention of the British Commercial Gas Association.

FUTURE POSSIBILITIES.

We often hear of saturation point having been reached in connection with the placing of gas appliances in consumers' premises. No gas undertaking can say with any degree of certainty how far they have progressed towards saturation point with regard to any apparatus, unless they make a special study and take a census of the appliances in use, and ascertain the further possibilities for the employment of gas.

The new Sales Organization Department of the British Commercial Gas Association, which has now been established under the direction of Mr. F. H. Holland, should prove of the utmost value to the gas industry. There is undoubtedly a large field for gas consumption still not properly explored; and the scheme propounded by Mr. Holland should be welcomed, particularly by those gas undertakings that have not hitherto paid much attention to the sales of gas section of their business. Just before the war broke out we in Birmingham made a start to obtain information as to the sales of gas opportunities on the district. The outbreak of war prevented us continuing the scheme; and we are not yet in a position to recommence our inspection work.

GAS AND THE HOUSING PROBLEM—WHAT IS BEING DONE IN BIRMINGHAM.

The attention of all gas sales sections should now be concentrated on ensuring that the houses being erected are all fitted with gas supply pipes of adequate size to meet not only the present requirements of gas usage, but to be sufficient for future needs. The golden opportunity for gas undertakings to instal gas supply pipes in the thousands of new houses has arrived; and the undertakings that do not use every endeavour to obtain for gas its legitimate national place in the new home will only have themselves to blame if gas is "pushed out" by any other competitor for lighting, heating, cooking, or hot water supply. Every new home is an opportunity for the gas salesman. If we do not take the opportunity of getting gas-pipes installed while the houses are being built, it is very doubtful if we get them adopted later on, if the builder provides other means for lighting or heating in the premises. The advantages of laying gas-supply pipes while the houses are in course of erection is obvious. We must see, however, that the pipes installed are well and properly laid, and of sufficient capacity.

We are paying very great attention in Birmingham to seeing that gas is installed, as far as possible, in all the new homes. We have recommenced our "New Building Section," which was in operation prior to the outbreak of war. This section is now in the charge of a New Building Inspector, who is responsible for keeping the records relating to new building schemes, for getting into touch with architects and builders, and advising them generally on the "layout" of the gas-supply system. The inspector is assisted by a New Building Foreman who is a thoroughly experienced gas-fitter. His chief duty is to see that the gas-fitting work in course of installation in the various properties is carried out to the specification laid down by the Department.

No legislation exists at present in this country to control the sizes or methods of laying gas supply pipes in buildings. Electricity, water supply, and other public utilities have regulations and bye-laws governing their installations. Why should not gas authorities enjoy the same facilities? It would clearly be to the advantage of the general public if such powers were given to the local authorities to ensure that gas supply pipes were properly laid. I have frequently during the past few years drawn attention to this matter, and am pleased to note that in one instance—Coventry—a clause has been included in their new Bill asking for powers for the regulation of the size and materials of gas-pipes and fittings upon premises supplied, with power to refuse a supply where the requirements are not complied with.

In view of the large numbers of complaints received by a gas undertaking which are due to defective gas-fitting work, causing inconvenience to the consumer and loss to the gas undertaking, I am of opinion that the National Gas Council should draw the attention of all gas undertakings, when depositing Gas Bills before Parliament, to the desirability of including a clause to give powers in the direction I have indicated. In the absence of any power to enforce pipes of specified sizes being installed in houses, we are offering an inducement to builders in Birmingham to instal pipes to our specification by laying the gas services to the new houses free of cost up to a distance of 30 ft. on private land. We are asking for nothing unreasonable. We require simply a well-fitted house with pipes capable of supplying gas satisfactorily, not only for immediate needs, but for the possible extension of facilities in the future. For instance, we ask that in a six-room house pipes for a gas-fire shall be laid in the parlour; that provision shall be made for gas-fires in two of the bedrooms, and, if the lay-out of the house permits, for the three bedrooms. I look to the time, certainly in the life-time of the houses now being built, when gas will be almost a universal fuel in the house. We cannot continue using our fuel resources for domestic purposes at the same rate as we are doing now. Most certainly, from the national standpoint gas ought to be used to a greater extent; and in the equipping of all new houses, due regard should be had to such considerations.

The real point to be emphasized is that the use of gas to everyone must be made easy. It frequently happens that persons who desire to have gas-fires introduced into their households decline to have them because such installation means that floor boards will have to be taken up for the laying of the pipes. They decline to have their domestic arrangements upset. A good deal of difficulty now experienced is due to the fact that the pipes that were laid in houses were not large enough for the requirements; and as long as this condition is allowed to continue, it is practically impossible for consumers to be fully satisfied with the gas they are using.

My next point has relation to the style of the fittings that should be provided by the various gas undertakings, and particularly with slot meters. There is much to be said in favour of fittings of a simple type; the plain down rod with inverted burner is all that is necessary, generally speaking, in a kitchen or hall. There is really little need, in the class of house under consideration, for ornate fittings. Much is to be said for the refined plain design which does not collect the dust like ornamental scroll work does. There is an elegance and simplicity about some electrical fittings which appeals to favour. Increased cleanliness in use is an important factor. The arrangement by which a pendant is dropped at intervals is effective. In Birmingham, we are making a new departure in bedroom lighting. The greater use of the pendant is now advocated, suspended, perhaps, midway between the window and the dressing-table, or over the dressing-table. The light will thus be overhead. It seems clear that a remodelling of our methods of illumination by gas is necessary if we are in the future to make its use really attractive to the public.

The Water-Heating Field.

Another field for the use of gas in the new building schemes must not be forgotten—that is with regard to water-heating. We have not been able to induce the authorities in Birmingham, so far, to instal as many water-heating appliances as we should like. These are, however, early days and we hope to do better. We are handicapped by the antiquated objections of the Birmingham Water Department. While certain appliances have been approved by the large water authorities in other cities, we, in Birmingham, cannot get our water authority to agree to the installation of certain types of gas-heated water apparatus. This is to be regretted, because it is standing in the way of fuel economy. By the use of appliances, such as the new "cottage water heater" there is a considerable saving over the methods with which we are familiar. It seems to me that this type of heater will in time meet with general approval.

Water heating by gas presents great possibilities. I may mention that we have two branch show-rooms for the display of gas appliances—one at Kings Norton, the other at Sutton Coldfield. We have there had displays from time to time of specific kinds of appliances. For one fortnight we showed all classes of water-heating appliances; another fortnight silk shades, &c.; and on other occasions cooking appliances, gas-irons, &c. During the display at Sutton Coldfield of the water-heating appliances we took 13 orders for circulators; the sales being outright, and 8 or 9 more on the hire-purchase principle. It is doubtful if a single order would have been received but for the window display.

Research Work and Industrial Apparatus.

We have recently made some research and experiments in Birmingham in connection with the use of gas for baking ovens. There is great scope for its application in this direction which hitherto has not received much attention, though in the United States gas is largely used for baking ovens. I believe the future will see a substantial development.

Gas Quality and Standardization of Appliances.

Other questions of importance relate to that of gas quality and the standardization of appliances. On them depend almost entirely the prosperity of the industry. We have to supply a gas which will suit our commercial requirements. As gas salesmen and those who have to deal directly with the public, whose needs we know, we have to say what the quality of the gas shall be. I do not mean that we, on the distribution side, should call the tune—merely that this matter is one for careful consideration and adjustment as between manufacturers, and those who business it is to foster gas sales. The first and main consideration is that the gas supplied is what customers require in their businesses or factories. The "satisfaction of the consumer" is the thing that matters; and this motto should have prominence in the gas engineer's office.

So soon as the industry can settle down with a knowledge as to the gas it is to supply, then we shall be able to do more with regard to the standardization of various appliances. With the standardization of appliances, we may hope to get some reduction in the cost of them. Without it, I cannot see any other hope in the near future of the price of gas apparatus being reduced. The remedy seems to be in a simplification of the various appliances, including cooking stoves. In my opinion there are too many sizes and types of stoves on the market. We get ovens varying slightly in size; thus necessitating different kinds of tins and bars. By standardizing these things, expenses may be cut-down materially; and early steps should be taken to give effect to this proposal.

The problem of maintenance has not received the attention it deserves. New appliances, when installed, frequently give the consumer perfect satisfaction—he may be enthusiastic about the matter; but the situation may easily change if the apparatus gets out of order. This may be due merely to the need of small adjustments. As the average householder neglects maintenance, it was up to the gas suppliers to see that the apparatus was properly maintained. No gas sale section can be fully efficient until it is backed up by an up-to-date maintenance department. The two are integral; they cannot be divided.

As to output, there is, in my opinion, a bright future for the sale of gas; but if the best results are to be obtained, those on the manufacturing side must keep pace with the activities of the sales department. During the war it was difficult to get material and plant; and in some areas—I am not speaking only of Birmingham—sales could not be pushed because of the inability of the works to give the supplies. When times are more normal, however, we must insist upon the proper amount of gas being available from the works to back-up the efforts of those whose duty it will be to sell it.

Discussion.

The PRESIDENT proposed a hearty vote of thanks to Mr. Rogers.

Mr. B. J. BELL (Birmingham), in seconding the vote, remarked that they had to deal, as in other industries, with the laws of supply and demand; and latterly the supply had been rather inferior. It was their duty to gather their forces, and take careful stock of the present position, with a view to keeping well abreast of the forward movement which they saw at work in every department. Certain important underlying principles needed careful consideration; and Mr. Rogers had very ably dealt with many of these. He complimented him on the broad view he had taken of the possibilities of the future, and fully agreed with his remarks on giving "satisfaction to the consumer." This was truly all-important. The prosperity of the gas industry depended very largely on the vast activities of the various undertakings in past years; and the few years of disorganization had brought out the goodwill so obtained. This goodwill must be retained by sustained efforts in the future. Speaking of points affecting new houses, he stated that many private builders needed little or no persuasion to put in gas-heated wash-boilers; and such a tendency they should welcome and encourage.

The vote of thanks to Mr. Rogers for his address was then warmly accorded.

Mr. DIXON (Birmingham) spoke of the difficulty experienced in the past to get architects and surveyors to decide on proper sizes for gas-services in buildings, with a view to the requirements of gas for all purposes being properly met. This was a very important matter.

Mr. DEANE (Wednesbury) suggested that, in view of the generally increasing gas accounts with which consumers were faced at the present time, due to the more extended use of gas appliances, it might help to have accounts presented more often, or perhaps to adopt some modified prepayment meter device admitting of the use of shillings instead of pence.

Mr. COBB (Birmingham), speaking of the difficulties experienced in the section dealing with gas-heated hot-water appliances, said they were faced at the present time with a high cost of apparatus generally. A gas-heated hot-water boiler alone cost £16; whereas an ordinary range boiler, tank, and fittings could be obtained for the same amount. The gas-boiler should be made cheaper somehow; but they could not afford to sacrifice strength in order to obtain reduction in cost. There was, in his opinion, a very large field for gas in water-heating problems. It was not always desirable to connect a gas-heated boiler to existing apparatus; it was a much wiser policy to get fewer orders and make the installations a complete success.

The HON. SECRETARY (Mr. Dean) remarked that for lighting purposes the choice as between gas and electricity was not always determined by cost alone. In the matter of gas-fires, they still had considerable ingrained prejudice to overcome, apart from the usual points of efficiency and cost. He agreed on the final importance of keeping the motto "Satisfaction to the Consumer" always before them.

Mr. CADWALLADER (Birmingham) said that he believed in the "all-gas" house. The appliances should be large enough, and services of sufficient size, to secure good efficiency of all the apparatus. He emphasized also the importance of proper maintenance. They ought to keep all appliances in order. Many which were sold outright they never heard of again. In his opinion, it would be a good advertisement for gas if all appliances, not only those on hire, were properly maintained.

Mr. SIMMONDS (Dudley) said he thought the future for gas was very bright. The idea of proper maintenance was an important one. In his past experience, the fight to convince the medical profession as to the hygienic aspect of gas-fires had been a stiff one; but they had succeeded. They needed a highly efficient sales staff and well-trained fitters to cope with the present and future demands for gas in housing and industry. In the new housing scheme at Dudley, they were providing for gas-fires in bedrooms and living rooms, and also for a gas-heated wash-boiler. The position of light units in bedrooms had also received attention; and the old method of wall brackets near the window had been discarded in favour of single pendants, which more readily lent themselves to artistic effect. He exhorted the members not to be afraid of advertising gas.

Mr. DAVIS (Birmingham) pressed the point of maintaining services as well as appliances, where old services were not adequate to properly meet modern requirements. This matter, unless attention was given to it, in some cases led to the consumer adopting electric light. The equipping of the fitters with force pumps was a useful step; but some old services could not be properly cleared out, and careful inspection with a view to deciding as to the need for renewal was an important matter. Speaking of the gas-heated hot-water boiler, he thought the use of hot-water radiators in connection with this, for the heating of rooms, was an application worthy of their consideration.

Mr. J. W. WOOD (Birmingham) remarked that, in reference to gas quality, some gases were not suitable for distribution. This was partly the reason for the work he had been privileged to carry out for the Gas Investigation Committee of the Institution of Gas Engineers. As to the old position of lights in bedrooms, he thought this might have originally been adopted as an attempt to secure light from the same direction

as that in which the daylight entered the room, so that light should fall first, in shaving, &c., on the face, and not on a mirror. He did not consider the gas needed to maintain hot water in a storage tank as waste, as they had the useful effect of the heat in warming the bathroom in which the tanks were usually fitted. In regard to the standardization of appliances, there was a risk here, since a high efficiency with gas of certain quality would imply lower efficiency if the quality were altered beyond certain limits, unless provision was made for adjustment of the appliances.

Mr. R. J. ROGERS, in reply, said that the tendency on the part of private builders to instal gas-heated wash-boilers, &c., in new houses, which Mr. Bell had mentioned, might be traced to the publicity of gas appliances by local gas undertakings, and to the fact that wash-boilers had proved to be best suited for work in the scullery. He did not advocate the use of gas for heating all the rooms in the artisan's house at the present time. Discretion in the use of gas was required continually if economy was to be secured. As to the points Mr. Deane raised concerning the more frequent collection of gas accounts and the use of modified slot meters, he thought the latter idea might be useful. He referred to the employment of meters of the Valon stop-type which were in use many years ago, but which did not meet with popular favour. He recommended in houses for artisans one coal-fire, which should be utilized for the purpose of the hot-water supply, with gas-fires in the other rooms, and a gas-cooker and wash-boiler in the scullery, as the most satisfactory arrangement at the present time. In reference to keeping water hot, he pointed out that they could not afford to keep hot too large a volume of water. They had to get rid of the idea of a large hot-water tank in a small house. A 20-gallon tank was sufficient for most houses. Regarding lighting, as the public required gas-services in houses for cooking and heating, gas for lighting implied little extra cost; and the effect of the burners in giving general warmth and in promoting ventilation should also be borne in mind. The question of the cost of gas appliances was an important one; but efficiency and strength must be maintained in spite of this. In reference to the question of maintenance, he was of opinion that maintenance of services and appliances should be included in the price of gas. Until this was done, they could not say that they had rendered the best service to the consumer. Bedroom lighting was better arranged in the modern method of using pendants; and the possible effects by adopting silk shades, &c., were more artistic than formerly. It was impossible to heat large rooms satisfactorily with a radiant fire only; and hot-water radiators, as mentioned by Mr. Davis, had an important application in this respect.

The Social Side.

During the evening a social gathering of members and their lady friends was held in the Reading Room, when several artistes contributed to a very enjoyable programme. The gathering concluded with a short period for dancing.

WOOLWICH ARSENAL GAS FACTORY.

Visit last Saturday by the London and Southern District Junior Gas Association.

SOME eighty members of the Association, with the President (Mr. S. B. Chandler) assembled at the main gate of the Royal Arsenal, Woolwich, on Saturday afternoon, to take part in an inspection of the gas-works, which had been arranged by permission of Brigadier-General C. P. Martel, R.A., C.B. They were met by the Gas Manager (Mr. W. Newton Booth, B.Sc., Assoc. M.Inst. C.E.), and, divided into parties, spent a profitable three hours under his guidance, and that of his assistants—Messrs. D. Hartley, W. Payne, and H. M. Brook.

The original factory, of which only portions of the retort-house and coal stores now remain, was built by convict labour prior to 1850; and much of the plant is on the site of an old convict settlement at Woolwich. Successive enlargements of the works were undertaken to meet increasing needs; and in 1914 the carbonizing plant consisted of inclined retorts, and the yearly make was about 300 million cubic feet. During the war, the works were almost entirely reconstructed on a scheme of modernization prepared in June, 1914, and intended to be spread over seven years; and at the cessation of hostilities the last of the obsolete plant was demolished, and the scheme of modernization is now practically complete. The factory occupies a site of some 3½ acres; and during 1917-18 the output of gas exceeded 1300 millions. The constricted site added greatly to the difficulty of maintaining the manufacture of gas while the reconstruction was in progress; and this is responsible for certain features of the design, &c., of the plant.

The parties were first of all conducted to the new arsenal coaling-pier, which is a reinforced concrete structure on the Coignet system, capable of berthing 2000-ton steamers. It is provided with a grab transporter and rubber belt coal-conveyor; the handling plant being of a capacity of 250 tons an hour. This, of course, is to meet the total requirements of the arsenal. The large coal is broken before it goes on to the rubber belt, and the bulk is weighed as it passes along on the conveyor. That intended for the gas-works is delivered into a 150-ton bunker, which feeds through an automatic gear the skips on the telpher plant for handling the coal inside the gas-works. The remainder of the coal goes into a 3000 ton ferro-concrete bunker.

The retort-house contains 22 settings of eight horizontal retorts, 22 in. by 16 in. by 18 ft. long, served by two De Brouwer combined stoking machines. The coke is dealt with by a similar telpher plant to that handling coal; and it can be deposited either in the store yard or into barges or hoppers, for loading carts and wagons or narrow gauge and standard gauge railway trucks. The whole of the coal and coke handling machinery is electrically driven from the arsenal supply. In the boiler-house, there are two Lancashire boilers fired with coke breeze, and provision has been made for a third. The house being on a clay foundation, arrangements are made for drawing the air required for the boilers through flues under the foundation mat, so keeping the foundation cool and avoiding shrinkage and settling of the plant, while at the same time slightly heating the air. There are three steam-driven exhausters with vertical engines, and a like number of steam-driven high-pressure gas-compressors, along with one electrically-driven compressor, each of a capacity of 36,000 c.ft. of gas per hour. There is also a compressor delivering gas into an arterial feeder main. The total capacity of the compressing plant is about 150,000 c.ft. per hour, for supplying the high-pressure gas requirements of the arsenal. The pressure used is 3 lbs. per sq. in.; and about one-half the total consumption of gas is distributed in this way. All the pumps on the works are collected together in one house adjacent to the exhauster-house, so that the whole of the steam power plant is under one roof.

There are two sets of purifiers—one of ferro-concrete, with five boxes, 29 ft. by 26 ft. by 5 ft. 6 in., and one of iron, with five boxes, 26 ft. square. They are worked on the forward rotation system. In the meter-house is a rotary meter of 120,000 c.ft. per hour capacity; and there is provision for a second meter of 60,000 c.ft. capacity, which has not yet been installed, though the connections are all in. The works are designed in three units, as far as the inlet to the purifiers, then two streams go through one set of purifiers, and one through the other.

The benzol recovery and tar dehydration plants are installed; and a recovery of about 1½ gallons of crude benzol per ton of coal is usually obtained. The tar dehydration plant has a capacity of 3000 gallons per day. The resulting crude naphthas are worked up to motor benzol, in a plant which has just recently been erected; the whole of the output being absorbed by the arsenal requirements. The sulphur content of the gas is very low—under 12 grains per 100 c.ft.—very largely owing to the benzol recovery. Quite a lot of CS_2 is washed out along with the benzol. A proportion of the dehydrated tar is used for admixture with creosote, as a fuel for special locomotives.

The last department to be visited was the shop in which is undertaken all the gas-fitting work of the arsenal; and here the members saw several things which particularly interested them. They were able to examine a small muffle furnace working up to 1300° C., and a metal-melting crucible furnace designed on the principle developed and patented by Mr. G. H. Roberts, C.B.E., M.Inst.C.E. (Chief Mechanical Engineer), and Mr. Booth, which was fully described on p. 188 of the "JOURNAL" for the 27th ult. Unfortunately, these furnaces could not be shown in actual operation, because the power was shut off. The visitors also inspected a number of special gas-fittings with incandescent burners, fixed for use at machine tools. These burners, which are on universal joints, so that the light can be directed towards any particular spot, are in successful operation in different parts of the arsenal.

The PRESIDENT, at the close, said it had been a very great privilege to go over the works. They would all agree with Mr. Booth when he told them that during the war he had had a very troublesome time. The demand for gas rose by leaps and bounds; and it reflected very great credit on his management that he was able to satisfy this demand. The visit had been of exceptional interest; and Mr. Booth and his guides had worked very hard to make it both pleasant and instructive. They must all have been impressed with the exceedingly fine coal-handling plant, as also the telpher installation, which he believed was the longest in the country—being something over 2000 feet. As the members would be aware, Mr. Booth and Mr. Roberts had devoted a great deal of attention to the subject of gas-furnaces and their efficiency. He had been told that in one furnace with which they had been experimenting the temperature within the furnace was somewhere in the neighbourhood of 1500° C., and the temperature of the flue gases only 100°, which was really a great achievement.

On the proposition of Mr. L. LACEY, seconded by Mr. W. A. BARNETT, a very hearty vote of thanks was passed to Brigadier-General Martel, Mr. Booth, and the other gentlemen who had shown them round.

Mr. BOOTH, in acknowledgment, said he would see that the vote of thanks reached Brigadier-General Martel. It was to him and to Mr. Roberts that they owed their visit there. As to himself and his assistants, it had been a pleasure to them to welcome so large a party. The present gas-works owed their shape and design largely to circumstances. In July, 1914, the arsenal suffered its only strike; and immediately after the strike, war broke out. During the week preceding the war, the demand for gas was about 4 million c.ft. In December of the same year, the weekly demand was 17 million c.ft. The highest figure that had been reached was 31 million c.ft. The arrangement of the plant had been largely governed by the way in which the demand grew. They had to maintain the supply. Consequently, everything was not precisely as one might have liked. The incandescent gas fittings for the machine tools they owed largely to Mr. Brook. It was not an easy problem. Some people would insist upon a flat-flame burner; but these particular fittings had been working in the arsenal for some months in the form in which they had just seen them, and in a slightly different form for two or three years. He believed they had shown that it was economical to use incandescent gas on machines.

An all-gas house exhibition, under the auspices of the Gas Committee of the Stockport Corporation, in conjunction with the British Commercial Gas Association, is being held at the Reform Club, Wellington Street, Stockport. The exhibition opened on the 2nd inst., and will continue for two weeks.

REFRACTORIES FOR COKE-OVENS.

By W. J. REES, F.I.C.

Before the members of the Midland Section of the Coke-Oven Managers Association on Jan. 31, Mr. W. J. REES, F.I.C., of the Department of Refractory Materials of the University of Sheffield, delivered an interesting lecture on "Refractories for Coke-Ovens," in the Applied Science Department of Sheffield University. Mr. A. H. MIDDLETON, of Consett, presided.

Mr. REES said: As a preliminary to the discussion of the properties desirable in bricks for coke-ovens, it will be advantageous to state the general conditions of their use.

(1) *Temperature.*—The temperatures which the bricks have to stand are not, in comparison with those met with in many other industrial operations, high. In the heating flues the maximum temperature under ordinary conditions of coking is not likely to exceed 1350° C.

(2) *Load.*—The load is not sufficient to seriously lower the refractoriness of any of the bricks in general use. It may be of interest, however, to refer briefly to the effect of load on the refractoriness of fire-clay and silica bricks.

(3) *Permeability to Gases.*—The bricks must become fairly gas-tight and the cement used must also, at the temperature of coking, produce gas-tight joints.

(4) *Resistance to Abrasion.*—The bricks must be mechanically strong enough at coking temperature to resist the abrasion of the insertion and withdrawal of the charge and also the abrading action of the hot gases.

(5) *Resistance to Corrosion.*—This is probably the most important factor with which it is necessary to deal. It will be desirable, therefore, to consider the composition and amount of impurities present in the coal which are likely to act as corrodants. Through the courtsey of Mr. J. H. W. Laverick, of the Tinsley Park Colliery, I have obtained the samples of which the analyses are here given. The corrosion of the oven walls at the coking plant of this colliery is comparatively severe, as it appears to be at all ovens in the Sheffield district when deep coals are coked. The coals which are at present worked at this colliery are: The High Hazels seam at a depth of 120 to 220 yards; the Barnsley seam at a depth of 216 to 316 yards; the Parkgate seam at a depth of 460 to 560 yards; and the Silkstone seam at a depth of 540 to 640 yards.

Further quantities of both chloride and sulphate were removed by continued treatment of the slack with hot 10 p.ct. nitric acid. The presence of a considerable proportion of sodium sulphate in the salts extracted from the coal by washing will be noted. It may be a factor of some importance in considering corrosion. By interaction with the coal, at the temperature of coking, sodium carbonate will be formed and be made by a vigorous corrodant. The pit water contained in the washing contains a large quantity of dissolved salts; and the point arose as to whether the use of pure water would be advantageous. Laboratory experiments showed that there was little or no gain in the extraction obtained from the salt by using distilled or town's water as compared with the pit water. There would, of course, be some reduction in the quantity of dissolved salts sent to the oven, in the water adhering to the slack, by using a purer water; but the cost of using (say) town's water would not be justified by the comparatively small reduction to be obtained. The rate of flow of water through the washery is a point possibly worth some consideration, as the concentration due to the solution of salts from the coal will be reduced with an increase in the rate of flow, and there will be a corresponding reduction in the salts contents of the water carried into the oven adhering to the slack. The analysis of a sample of water from a dripper in the dip workings of Manton Colliery is also of interest:

Sodium chloride	110 grams per litre.
Calcium chloride	41 " "
Magnesium chloride	40 " "
Total solids	210 " "

Taking the Tinsley Park figures, there will be carried into the oven with each charge of slack and adhering water approximately 50 lbs. of sodium chloride and 20 lbs. of sodium sulphate. The salt present will begin to volatilize at 800° C. (to a small extent at lower temperatures, as salt has an appreciable vapour pressure at temperatures below its melting point). In addition to this removal of salt by volatilization there will be some removed by hydrolysis, as steam from the centre of the charge comes into contact with the hot coal. The hydrolysis of salt can be readily shown by dropping a solution of it on to a hot basin, when fumes of hydrogen chloride can be detected in the issuing vapour, and an alkaline residue is left. It has been shown that this hydrolysis is appreciable at 700° C. An interesting piece of work bearing on the dissociation of salt was brought before the Ceramic Society in 1918 by H. V. Thompson.

The action of salt upon clay has been extensively studied in connection with the phenomena of salt-glazing; and this directs attention to a very important difference between the conditions of salt-glazing and the conditions which result in the corrosion of fire-clay coke-oven bricks. In salt-glazing the kiln atmosphere will be much richer in salt vapour than a coke-oven at any period; but the salt is not applied until the articles to be glazed are at a temperature of about 1200° C. At this temperature the salt will immediately combine with the clay, forming a glass—essentially sodium aluminum silicate, though iron oxide probably plays an important part—which coats the exposed surface of the clay and protects it from any further attack by the salt vapour. The important factor in salt glazing is that the articles to be glazed shall be at the temperature at which the interaction between the salt and the clay is rapid. In the coke-oven the conditions are essentially different. In most furnaces the hottest face of the brickwork is that containing the material being heated; but in the coke-oven the hottest face is the heating flues—the internal wall of the oven does not reach the temperature at which salt glazing is rapid. It has been proved experimentally, however, that while at high temperature interaction between two substances is rapid, this interaction may take place at quite low temperatures, and even at atmospheric temperature, although the rate of reaction will be very low. The general form of this lower temperature reaction may not be the same, though the same compound will be formed, particularly if either one or both of the reacting bodies are porous.

Prof. Cobb, in a series of papers read before the Society of Chemical Industry in 1910 dealing with the synthesis of silicates, showed that interaction between sodium carbonate, alumina, and silica will take place at temperatures much below that at which the mixture becomes fused and interaction is rapid. In the coke-oven, the salt vapour, instead of reacting with the surface of the bricks, will penetrate them. There may be some deposition of salt inside the brick, and some of the vapour may pass on to it until it reaches a zone in the brick at which the temperature is high enough for interaction to take place with some rapidity. The joint result of the slower interaction in the cooler portion of the brick and the more rapid action in the hotter zones will be the formation of a weak spongy mass, which is becoming increasingly more open to the attack of the salt, and which may fall away or be dragged away by the moving coal or coke. Another important phenomenon in connection with this corrosion, to which your attention has been previously drawn by Prof. Fearnsides, is the very general presence of a layer of hæmatite in the portion of the brick where the disintegration and shearing of the brick are taking place. This is probably due to formation and volatilization of ferric chloride by the action of the salt vapour on iron oxide present either in the coal or more probably in the bricks.

	Water from Pumping Station.*	Water in Circulation in Washery.	Drainage Water from Washed Slack Hoppers.
	Grams per Litre.		
Total solids	1·469	2·780	3·290
Lime	0·154	0·095	0·102
Magnesia	0·143	0·108	0·098
Sodium oxide	0·304	1·078	1·402
Potassium oxide	0·028	0·033	0·038
Chlorine	0·274	0·928	1·180
Sulphuric anhydride	0·480	0·593	0·626
Carbonic anhydride	0·069	0·051	0·044
Iron and alumina oxides	0·002	0·006	0·013
Silica	0·011	0·014	0·018

*This water is pumped from shallow workings only.

Probable Combinations in which the Above Ingredients are Present in the Waters.

	Water from Pumping Station.	Water in Circulation in Washery.	Drainage Water from Washed Slack Hoppers.
	Grams per Litre.		
Sodium chloride	0·451	1·529	1·944
Sodium sulphate	0·149	0·524	0·768
Potassium sulphate	0·052	0·062	0·072
Calcium sulphate	0·243	0·168	0·165
Magnesium sulphate	0·357	0·264	0·261
Calcium carbonate	0·095	0·057	0·062
Magnesium carbonate	0·051	0·041	0·023

Solid Residues from Evaporation of Drainage Water from Washed Slack Hoppers.

	P.Ct.
Sodium chloride	60·87
Sodium sulphate	24·67
Potassium sulphate	2·20
Calcium sulphate	2·58
Magnesium sulphate	4·73
Calcium carbonate	2·82
Magnesium carbonate	0·87
Iron and alumina oxides	0·61
Silica	0·44
	99·79

Water Extraction.	Unwashed Slack.	Washed as Delivered to Ovens.
	P.Ct.	P.Ct.
Sodium chloride	0·37	0·18
Sodium sulphate	0·19	0·08

An example of the corrosive action of salt came under my notice some years ago in connection with some experiments on the effect of heat on mixtures containing salt, limestone, and sand. At free temperatures of from 1350° to 1400° C. the clay lining of the containing vessel was very rapidly corroded. The clay was replaced by a silica lining, and the corrosion was very considerably reduced.

The question naturally arises as to which is the best brick-making material to use for the walls of coke-ovens. The experimental evidence indicates that salt corrosion is likely to be much more severe on fire-clay bricks than on either alumina or silica bricks. But besides corrosion there must also be considered the changes in dimensions of the bricks on long continued use at coking temperatures—changes which may be facilitated by the presence of the salt vapour. With a fire-clay brick, even if it has been well burned and contains a large proportion of properly burned grog, the tendency at first will be towards a reduction in size—neglecting for the moment the ordinary reversible thermal expansion and the consequent opening of joints and formation of leakages. This may be followed at a later stage by an expansion of the portion of the brick which has absorbed the salt vapour, due to the internal pressure on the softened brick from the evolution of gas when the salt and clay react. This phenomenon is analogous to that which is known to the brickmaker as bloating.

Our knowledge of the general mechanism and chemistry of bloating is not large, and its real importance in connection with the use of bricks for specific purposes is not fully realized. However, the result of this bloating action in the coke-oven wall may very well be a breaking-away of the face of the bricks—a new face being presented which will be in condition for the salt vapour to have an enhanced effect. With an alumina brick, the physical changes will be in the direction of continuous contraction. This practically rules-out this type of brick, unless an electric furnace product, such as "alundum," is used. At present, the cost of this is probably prohibitive for the particular purpose. There is no quantitative evidence which would indicate whether the high initial cost of a brick of this type would be counterbalanced by the increased life of the oven. With a silica brick the physical changes are rather more complicated. In addition to the ordinary thermal expansion, there is the reversible expansion from the g-b inversion in quartz, which takes place at about 570°; the reversible expansion due to the g-b inversion in tudymite and the cristobalite, taking place at 120° C. and at 180° to 270° C. respectively; and the very usual growth of the brick due to the gradual transformation to tudymite (beginning at about 870° C.) of the quartz in the brick. These expansions may cause stresses which would have a serious effect on such a complicated structure as a modern coke-oven.

It will be necessary to consider later whether or not this last-mentioned growth (due to the quartz-tudymite transformation) is avoidable. If it is, then it may possibly be a matter of first-rate importance to coke-oven builders and users. I quite believe that attempts have been made to use fire-clay bricks with either glazed faces to prevent penetration, or with a thin face of some material (such as alumina or silica) which would offer greater resistance to corrosion than the fire clay. These trials were unsuccessful, mainly because of the different co-efficient of expansion of the glazed face or the coating material and the brick itself, resulting in a rapid scaling-off of the glaze or facing material.

Practice in this country has in recent years been mainly to use a brick which has been a compromise. The addition of silica in the form of crushed silica rock (preferably ganister) to a fire-clay, in quantity sufficient to raise the silica content of the mixture to about 80 to 85 p.ct., gives a material in which, with suitable manufacture, the contraction which the clay undergoes is about balanced by the expansion of the silica when the brick is used at coking temperatures. Instead of an artificial mixture of quartzite and clay, use is also made of a naturally occurring siliceous clay in which the silica content amounts to about 80 to 85 p.ct. The behaviour of bricks made from this latter material will not be quite the same as that of the quartzite-clay brick, because in the naturally-formed siliceous clay the fragments of the silica will be, generally speaking, much smaller, and in much more intimate contact with the clay, than in the artificial mixture. I am not prepared to say which type makes the better brick for the purpose, although I lean towards the opinion that the use of the naturally occurring mixture possesses some advantages in the direction of uniformity of texture which are not altogether shared by the artificial mixture. Whichever type is used, however, the net result, as far as physical behaviour is concerned, is a brick which remains fairly constant in volume at coking temperatures, and so tends to reduce to a minimum the possible formation of leakages. Prof. Fearnsides has previously addressed you on the important subject of the texture of this type of brick, so that I will not do more at this point than emphasize the extreme importance of uniformity of texture. Whether the texture be fine or whether it be coarse, let it be uniform.

Before leaving this question of fire-clay, there is one other point to which I should like to refer. In investigating the corrosion of glass-house pots and tank blocks by the glass and the "slags" which are formed during the melting process, it has been found that pots and blocks in which the composition and the thermal treatment of the materials are such that a high proportion of sillimanite is formed are much more resistant than those made from clays, the composition or thermal treatment of which do not lend to the formation of any large proportion of sillimanite. It appears from this that sillimanite does not readily react with fluxes; and it would be of interest to know if, under the different conditions of coking, the same order of resistance occurs. The crystallization of sillimanite referred to also results in low porosity—a section showing a close interlacing of the needle-like crystals in a matrix of vitrified material—a matter of considerable importance in any type of corrosion.

A factor which will be common to all coke-oven bricks, in reducing the porosity or influencing disintegration, is that due to the deposition in the pores of the brick of carbon from the decomposition of hydrocarbons in the coke-oven gas or from the gases in the combustion flues. Neither must it be forgotten that the reduction to the ferrous state, by the gases, of any iron oxide present, and the formation of easily fusible ferrous silicate, must play a part of some importance in its effect on the behaviour and life of the brick.

The characteristics of the ordinary pre-war type of silica brick which militated against its employment in coke-ovens were its continual growth during use, its rather high porosity, and its tendency to spalling from the repeated changes in temperature. I understand that American practice has been largely in the direction of the use of silica bricks. There are perhaps factors in connection with the size, construction, and general coking practice which have minimized the difficulties in their use. It is quite certain, however, that, at an early period, it was found essential to take special precautions in the manufacture of the silica bricks used, and more particularly to burn them thoroughly. In making silica bricks it is necessary to add to the crushed silica rock some material that will at high temperature act as a kind of bond. The material almost invariably used is lime. This addition of lime, of course, reduces the refractoriness of the silica; and the proportion which is, or can be, used depends on the size of the fragments of quartz (more particularly on the proportion of very small fragments), on the impurities present in the silica rock, and on the use to which it is intended the brick shall be put.

On examination, a silica brick will be seen to consist of fragments of crystalline silica set in a matrix (often rather "glassy" in character) which is mainly composed of calcium silicates, calcium-iron silicates, and calcium-alumino silicates. Now in connection with the provision and use of silica bricks for coke-ovens, the size and grading of the fragments of silica and the composition of the matrix are of paramount importance. During the burning of a silica brick, the lime added (possibly in conjunction with any iron oxides present) reacts with the silica and goes on dissolving until it is saturated. Crystallization of silica then takes place, and at temperatures between 870° C. and 1470° C. this will be in the form of tridymite, with a specific gravity of 2·27, as compared with 2·65 for the original quartz. More silica is then dissolved, and a further crystallization of tridymite (or, if the temperature is above 1470° C., of cristobalite with a specific gravity of 2·33) and so on.

It will be obvious that this solution of the quartz will be facilitated if it is present in fine particles, because of the much greater area of surface exposed to the reacting fluxes. It is this recrystallization of the silica which gives to the brick its mechanical strength, and the transformation from quartz, with a sp. gr. of 2·65 to tridymite with a sp. gr. of 2·27, which causes the increase in volume of the brick. If in burning the brick a maximum of conversion of the quartz to the form of lower specific gravity is obtained, it is evident that the increase in volume of the brick during its subsequent use can only be small. Further, if by special grading of the raw materials and the forming of a suitable matrix this recrystallization of the silica will take place so that the newly-formed crystals tend to interlace instead of to push against each other, the increase of the brick will be less (particularly during its period of use), the mechanical strength will be increased, and the porosity reduced. If then, these two factors of suitable grading and adequate burning can be combined, a brick will be produced with physical properties which will perhaps make its successful work in coke-oven use a possibility.

Three years ago, experimental work was carried out in France, under the direction of Le Chatelier, which has definitely indicated that, by substituting for the ordinary fine material used to make the brick (fine material generally obtained only fortuitously during the crushing and mixing operations), an impalpable powder obtained by grinding the raw silica rock in a tube-mill, a brick of distinctly superior physical properties could be produced. Test-bricks were made, using crude quartzite containing grains up to 4 mm. square, finely crushed quartzite (sifted through a 100 sieve), impalpable quartzite powder from a tube-mill, with the addition in each case of 2 p.ct. of lime. These test-bricks were burned at Cone 19 (approximately 1500° C.); and the following results [see table next page] were obtained from them in standard tests.

The superiority of the brick containing 25 p.ct. of the impalpable quartzite powder is very apparent. Expansion of these bricks during their burning and subsequent industrial testing was less than that of a brick as ordinarily made, though, as indicated by the specific gravity, the transformation of the quartz was fairly complete. This experimental work has been amplified in this country, and it has been proved on the large scale that by using a silica rock which on crushing gives angular fragments, by suitably grading these crushed fragments, and by mixing them with a definite proportion of impalpable silica-powder (with which the bonding material has been mixed), bricks can be produced which have a very satisfactory texture and in which the after-expansion during use is small. A year or two ago some silica bricks which

Composition of Mixtures.	Linear Expansion.	Density.		Crushing Strength in Kilos. per Sq. Cm.		
		Apparent.	Real.	Cold.		At 1600° C.
				Dried.	Burnt.	
75 crude quartzite 25 impalpable ,, 2 lime	5·2	1·63	2·35	15	165	30
75 crude quartzite 25 fine ,, 2 lime	..	..	2·33	10	60	8
25 crude quartzite 75 impalpable ,, 2 lime	3·9	1·36	2·35	9	135	10
25 crude quartzite 75 fine ,, lime	..	..	2·33	6	52	3

had been made from raw materials and under conditions which gave an approximately similar constitution to the brick as just detailed were used in the repairs of a coke-oven in South Yorkshire where the corrosion trouble had been severe. These bricks have given the most promising results, and certainly lead one to anticipate that, by suitable manufacture, silica bricks can be made whose chemical and physical behaviour in the coke-oven walls will be satisfactory. The presence of a little iron oxide in the raw materials, and even its addition to the brick mixture, have been found to have a favourable influence on the rate of transformation of the quartz to tridymite.

The following is an analysis of a silica brick which has a satisfactory physical constitution; but it will be obvious from the foregoing that, within limits, the texture and mineralogical constitution of the brick are of more importance than its chemical composition:

SiO_2	95·16 per cent.	CaO	1·88 per cent.
Al_2O_3	1·29 ,,	MgO	0·15 ,,
Fe_2O_3	0·78 ,,	K_2O	0·51 ,,
TiO_2	0·15 ,,	Na_2O	0·24 ,,

The conductivity for heat of the refractory material employed for the coke-oven is a question which needs some consideration. This is so much influenced by factors such as the temperature of burning, the porosity of the brick, &c., that no figure short of that obtained by actual determination on a particular brick is of any great value. Both measurements and experience in American coke-oven practice indicate that, at coking temperatures, the conductivity of a good silica brick is decidedly greater than that of a fire-clay or semi-silica brick. This should be another point in favour of the use of silica bricks in coke-oven construction.

Mr. Rees, in conclusion, referred to several samples of coke-oven brick which he had brought for the inspection of the members. The French bricks were a very fine product; but the cost of making them was very much greater than that in this country. These questions of cost of materials, however, were after all only comparative. If one was going to get a long life out of a material, it might be well worth while to pay twice or three times as much for the brick. In all the bricks he showed, the texture was exceedingly uniform—the poor spaces were very small, and the grading was particularly good. Special attention had been paid to the grading, just as in the making of concrete one attended to the materials so that all the voids would be filled up and a satisfactory product thus secured. Wherever any crushed material was used, it should be properly graded. He would emphasize the good make of brick which would be produced by the use of a mixture of the fine material. In these bricks there was no breaking-away of the edges in burning or in the cooling-down of the kiln.

DISCUSSION.

The CHAIRMAN, referring to the subject of fine and impalpable powders, asked what exactly would Mr. Rees regard as an impalpable powder.

Mr. REES: Powder the whole of which would go through a sieve smaller than 200—a real silica flour.

The CHAIRMAN said the Association were to be congratulated on having secured Mr. Rees for a lecture on this important subject. Referring to the absence of the brickmakers—for which he believed the rules of the Association were accountable—he said he thought it was as essential that the brickmakers should hear this lecture as that the members of the coking industry should hear it. It was high time that the three branches of the work—the brickmakers, the coke-oven managers, and the scientific research people—should co-operate in getting to the bottom of their brick troubles, and put their heads together to devise the best type of brick that could be used in coke-oven practice. He had been interested in the remarks on silica bricks in American practice. It was a subject to which he had given considerable attention recently, as his company were about to put up a number of new ovens to carbonize about 6000 tons of coal per week; and they had considered the question of going in for the American practice. As the capital cost of ovens was now so great, it naturally occurred to them whether they should not put up the larger ovens and go in for the shorter hours of carbonization that they did in America—roughly, 15, 16, or 18 hours, as against the British 27, 30, or even more hours. If they did go in for this higher temperature, they would need to have a different type of brick from that generally used here. It was often considered that high-temperature carbonization meant the sacrifice of bye-products. He was not at all sure that this necessarily followed. From some experiments he had made, he was rather coming to the conclusion that one could use quite high temperatures without decomposing the bye-products, provided that the tops of the ovens were kept very much cooler than was usually the case. They were, of course, up against the question as to where they were going to get the bricks from. He was not satisfied that there had been enough done in this country in the making of silica bricks to warrant one putting up a large battery of ovens with this type of material until a good deal more was known about it. Some people held that to make a good silica brick they should use a comparatively large amount of large material in the matrix—$\frac{1}{4}$ in. and over. Others, including Mr. Rees, told them they should use 75 p.ct. of stuff up to $\frac{1}{4}$ in., and 25 p.ct. of impalpably fine material. Yet others held that there should be an enormous quantity of impalpably fine material. Again, there was a difference of opinion in regard to the temperatures at which they should burn. Sometimes they were told they should burn for a short time up to 1650°. Others said they would get the same results by burning for (say) a couple of days up to 1350° to 1400° Fahr. Mr. Ross, lecturing in America, stated that the best results were obtained from burning for as long as fourteen days at a temperature of from 1200° to 1450°. This would render brick-making extraordinarily costly at the present price of coal. It was for elucidating such points as these that the coke-oven managers welcomed the co-operation of men like Mr. Rees. It was high time something was done to get at the bottom of these divergent views. He thought the Universities were inclined to do their share, and was sure the coke-oven managers would like to co-operate. The people who were really most closely concerned, and who, it seemed to him, had done the least, were the brickworks owners, the coke-oven owners, and the colliery owners. It was time they devoted a little more attention to the matter.

Prof. FEARNSIDES (Metallurgical Department, Sheffield University) said if all those present felt as he did, they would think the trouble would be to get so much knowledge as Mr. Rees had given into their heads in the course of a single afternoon. He would like at once to reply, in some measure, to the remarks of the Chairman as to co-operation in research. The Chairman was from another area; and it was fairly evident that he was not aware of how it came to pass that they had Mr. Rees in the University. Mr. Rees was the head of the Research Department; and he was there because the South Yorkshire Colliery Association put down £1000 not very long ago for coke-oven research. He was there also because the brickmakers had put down similar financial support, and also because the steelmakers assisted in the provision of funds for research. They saw, therefore, in the Department represented by Mr. Rees, a live department which came directly from the association of the people who made with those who consumed. It was the object of the department to continue to be the go-between in research and improvement; and they found that both the consumers and the producers were willing to "put their cards on the table" in this matter. With the enlargement of the existing department, they could see something which would have very great possibilities for usefulness to industry. The department in the Sheffield Univertity had taken a very important part in bringing forward the advantages which would come when silica was used for flue-making and oven-lining, and other furnace work where the temperatures were kept above 1200°. Fire-bricks were considerably more manageable in all furnaces in which the temperature was maintained below 1200° for long periods together; but as soon as they obtained a predominance above 1200°, they at once got to a place where silica would do the work more efficiently than any fire-brick materials ready to hand. Mr. Rees had mentioned the excellent practice which had sprung up in France in the study of the physical chemistry of silica and other things as an outcome of the war. It was his good fortune, about a year ago, to go over some of the French brick-works. They had no traditions as to how a silica brick should be made; but they learned that Great Britain was not making as many bricks as she required, and bricks had to be turned out in France quickly. He saw a steel furnace lined with silica bricks which, instead of having 200 to 300 heats (considered a good record in a British furnace), had actually been through 700 heats and more. The cost per thousand of the French bricks had been over £20, as against the British £7; but he was convinced that the French had got an article which was well worth the higher price, compared with the materials available in this country. There were now got silica brick makers in this country who were willing to take a specification which compelled them to put in about 25 p.ct. of material which would not pass through a sieve one-sixth inch mesh and another 25 p.ct. of materials so floury that it left less than 15 p.ct. residue on a very fine sieve of about 200 mesh. He did not think either of the things mentioned by the Chairman as to length of burning were really essentials. He believed the kiln atmosphere to which the bricks were subjected while burning was far more important. They knew that certain bricks, burned under certain conditions of firing, gave good service as against similar bricks burned under other conditions of firing. With regard to the question of salt, this was a very difficult problem for departments such as that of Mr. Rees to tackle. They had at least two dozen variables acting at once. They could control one sometimes by experiments; but it would be years, even with very extended team-work on the subject of salting, before they would get any results at all. He had recently had something to do with some silica retorts in gas-works, and had been up-against a carbon deposition like a scurf. The question arose as to whether the reactions taking place were due to the material coming out of the coal or to the reaction of these materials with the gases coming in from the flues. He would like information as to whether coke-ovens were working with reduced pressure inside as compared with high pressure outside. He believed that when they knew more about the permeation of gases into brickwork they would be nearer understanding the problem of refractory materials. He supposed that all who spoke of American practice recognized that most of what was talked about in America was the carbonization of dry coal. It was one thing to put wet coal in an oven and have water remaining in the coke for twenty hours, and another thing to put dry coal in and have all the water gone out in three or four hours. This would matter very greatly in

the volatilization of heaps of things. His own interest in this subject, as a geologist, had been in the provision of the material from which manufacturers would be able to make the necessary bricks. Sheffield owed its reputation for silica bricks to the fortunate circumstance that it had the ganister. Over many square miles in England were deposits of material which was well described as crude quartzite, the composition of which was not far different from ganister. He thought that it might eventually mean that for the not too severe service in coke-oven practice they would not need to draw on costly ganister, which was a necessity to certain makers of high-grade steel, and would get suitable material for coke-oven bricks from deposits that were available in the country.

The CHAIRMAN remarked that nothing that Prof. Fearnsides had said would tend to make him withdraw one word of what he had expressed about the necessity for greater co-operation between the coke-oven people, the brickmakers, and the works owners. A mere £1000 was nothing for research. Prof. Fearnsides, indeed, had only emphasized the great necessity for further research; and no doubt he realized this quite as fully as he (Mr. Middleton) did, and the need for very much greater contributions from the owners of the various materials and works. He had recently written to four makers of good silica bricks for information as to the temperature at which their bricks softened. Three of them—two were in the Sheffield district—replied that they actually did not know. [Prof. Fearnsides: We cannot find out.] It was not the fault of the people from whom he had inquired—it was simply because they had been blessed with good material. But it was necessary that all the brickmakers should pay a great deal more attention to the scientific side of brickmaking.

Mr. W. GREEN said it was rather unfortunate that the members could not have the paper before them prior to the meeting, because he believed there were some who could have brought analyses on some of the subjects touched upon by Mr. Rees. A few years ago Prof. Fearnsides had lectured to the Midland Section—giving an address which very well opened-out the subject of refractory materials. But it did not go into the great amount of detail which Mr. Rees had given that afternoon. He hoped a further opportunity would be given for discussion on the paper later in the session—after they had been able to read it closely in the Technical Press. It was a subject which ought to be fully ventilated. At a meeting three years ago, when Prof. Fearnsides had given an address, he (Mr. Green) had asked that the Coke-Oven Managers' Association should back-up this subject more; and a Refractories Research Committee was subsequently formed. He was sorry to say, however, that, though he had since inquired, both in Council and in general meeting, for some results of the Committee's work, up to the present he had received none. It was essential that they should work on the lines suggested by Mr. Middleton—they should have a co-operative committee between the makers and users and the Universities. Personally, he greatly appreciated the work which had been done at Sheffield University; and he thought it was high time the various technical associations concerned "got a move on" in this matter. With regard to the analysis of water, some time ago he found the water out of the pit was very heavy in dissolved solids. His own figures were in grains per gallon, rather than in Mr. Rees's more scientific measurement of grammes. The water contained 1170 grains of dissolved solids per gallon, and there was a certain amount of calcium carbonate and calcium chloride and a high percentage of sodium chloride. This was the water he was sampling, but not the water that they were using. He had two more analyses of waters—one taken before the water was used for washing, and the other after the washing. The total solids before use for washing were about 110 grains per gallon, and after washing about 490 grains—after washing for about a week. The chief increase had been in the chlorine content; the sulphate altered very little. He had also entered on some work in extracting the soluble salts by water extraction on the original coal sample; but this work had not yet been brought to maturity. In regard to the unwashed slack, at his place they had had samples of coal before washing with sometimes as much as 1 p.ct. of sodium chloride content; but the content going to the ovens in the washed slack containing the adhering water as well as the content salts inside the coal, was about 2 p.ct. of sodium chloride. In regard to the hematite deposit, over three years ago he had found that this took place at his works. They had bricks which were picked out, and all on the front the outer surface had come off, and there was a red face. But they had obtained some bricks from higher up in the oven which showed signs of crust; and in between this crust and the rest of the brick material there was a small space containing beautiful red flakes of the hematite deposit. They always found that the corrosion of the bricks was at its worst in the few bottom courses of the wall, and they had to remember the great weight these bottom courses had to bear. He had tried some bricks with special facings, as mentioned by Mr. Rees, but they did not prove a success. This was some four years ago. Having reason to reline an oven near the one concerned, it necessitated cooling-down the wall, and they found the facings on the bottom course readily broke off, and on cooling a course higher the bricks also began to lose their face. They put it down to the coefficient of expansion not being equal to the face of the material.

Mr. B. WILSON HAIGH said he thought that Mr. Green's suggestion as to a further discussion of the paper was very wise. They were very greatly indebted to Mr. Rees and Prof. Fearnsides for their presence and their help, and also to Mr. Middleton, who, coming as a visitor from the Northern Section, had presided over the meeting in the absence of their own Chairman, and had given them some results of his own experiences. He moved a vote of thanks to these gentlemen.

Mr. T. B. SMITH, seconding, said he considered the old-fashioned method of trying one brick after another was dying out. It was part of the training of the modern coke-oven manager that he should not only know the failings of the coke-oven walls, but he should get sufficient knowledge to reduce the failings to the minimum.

Mr. FLEMING said he noticed Mr. Rees had stated that the use of distilled or fine town's water for washing coal did not seem to remove the sodium chloride to an extent which would make it worth while getting the costly town's water. He had himself investigated this matter, and found quite the opposite result. In the case of Barnsley coal, by using town's water there was a very considerable reduction; and if they could get town's water at a reasonable price, he thought they could remove all the salt which really seemed to matter.

Mr. REES, in answer to Mr. Fleming, said, of course, one particular seam of coal might be more accessible to salts than another. From the practical point of view, however, there was not sufficient advantage to warrant the cost of town's water. Certainly there would be an advantage in the small reduction of total solids by using pure water; but with town's water at 10d. or 1s. per 1000 gallons, the cost would be enormous, and would run into many thousands of pounds per year with an ordinary washery. He was sorry he had not found it possible to get advance proofs of the paper issued to the members; but if he could be of any service by attending a future meeting and replying to any discussion, he would be glad to do so. With regard to the remarks of the Chairman, he could assure him that the question of co-operation had been receiving a good deal of attention in the Sheffield district. He would like to express his own personal appreciation of the way in which he had been received both by the maker and the user of the bricks. In his opinion, users of silica bricks in the district were most anxious to take advantage of any information which could be given to them. With reference to the remarks as to the softening point, silica had no definite softening point. It had a softening range; but it was impossible to say actually when the softening began and when it really became dangerous. All one could say was that a cone of it, at a certain temperature, bent over. This did not tell much, unless they knew the atmospheric and other conditions at which it was carried on.

THE USES OF GAS AND ELECTRICITY.

A Joint Meeting of the Midland Junior Gas Association and the South Birmingham Centre of the Institution of Electrical Engineers took place at the University of Birmingham last Thursday evening. There was an attendance numbering about 250. Great interest was taken in the subject; and members of organizations such as the Society of Chemical Industry, the Institution of Mechanical Engineers, and the Metallurgical Association were present as visitors.

Dr. E. W. Smith, the Chief Works Chemist of the Birmingham Gas Department, opened the debate in spirited fashion, speaking from the point of view of the utilization of fuel for the generation of power. The arguments for the electrical engineers were well presented by Mr. F. Forest, the Assistant Engineer of the Birmingham Electrical Supply Department. Dr. C. M. Walter, of the Research Laboratory of the Birmingham Gas Department, spoke upon the industrial application of the two agents—gas and electricity—with special reference to gas-furnaces for industrial purposes; while Mr. F. J. Moffatt, a Consulting Electrical Engineer, presented the case for electricity; Mr. R. J. Rogers (Fittings Superintendent of the Gas Department) discussed the question of domestic appliances, emphasizing the virtues of gas; and Mr. N. B. Rosher, a Consulting Engineer, dealt with the case from the point of view of electricity. The final question discussed had relation to the transmission or distribution of power, which was treated of by Mr. R. G. Marsh (gas) and by Mr. W. W. Wood (electricity). A well-sustained debate, in which other members present took part, was wound up by Dr. Smith and Mr. C. C. Garrard, the President of the Electrical Engineers Centre. The Chairman urged the importance of gas and electricity in corporation undertakings being in charge of one committee, and not two as in Birmingham.

A full report of the proceedings will appear next week.

Temporary Increase of Charges Act.—The Ministry of Health has made an Order under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, authorizing the Ashford Urban District Council to increase the maximum price of gas from 5s. to 6s. 6d., subject to a rebate to domestic consumers.

Coke Dust as Boiler Fuel.—At a large gas-works in the Midlands, says the "Iron and Coal Trades Review," two water-tube boilers have been recently installed, each capable of evaporating 10,000 lbs. of water per hour. The stokers are of the Babcock chain-grate type, with an area of 70 super. ft.; and the heating surface is 3140 sq. ft. each. Forced draught is delivered by a fan supplying 18,000 c.ft. of air per minute at 1½ in. pressure. Coke dust is used with excellent results; and the boilers can dispose of about 30 tons of dust per day. Unscreened breeze or coke dust mixed with the ashes drawn from the retort-house producer ash-pits was tried, with good results. The only adjustments necessary to keep an incandescent fire were to increase slightly the air pressure, and work with the back-wing dampers one-quarter open, with a fuel thickness of 4 in. on the grate. The fuel handled per week is on an average 170 tons of dust and 40 tons of unscreened breeze and ashes, at a total cost of £90, with an average evaporation of 2,380,000 lbs. of water. The chief necessity for good working is the systematic cleaning of the back chamber flues, the "blowing down" of the tubes, and also keeping the top of the combustion arches clear of dust. All these operations can be easily carried out while the boilers are working. On the same works a battery of seven Lancashire boilers fitted with Wilton grates are being fired with satisfactory results with unscreened breeze containing 50 p.ct. of dust. Here again, the secret of good results is systematic flue cleaning. The use of coke dust for boilers was referred to by Mr. C. C. Barber, of Birmingham, in his Presidential Address last year to the Midland Junior Gas Association [see "JOURNAL" for Oct. 28, p. 190.]

A NEW CHARACTERISTIC FOR COAL.

A paper on "A New Characteristic for Coal: The Agglutinating Curve," by Captain F. S. SINNATT and Mr. A. GROUNDS, was read by Captain Sinnatt at a meeting of the Manchester Section of the Society of Chemical Industry on Friday last. The investigation was carried out under the auspices of the Lancashire and Cheshire Coal Research Association.

It was known, said Captain Sinnatt, that if the caking coal was mixed with a certain proportion of such finely-pulverized inert substances as sand or anthracite, and the resulting mixture carbonized, the coke would not form a coherent button when the proportion of inert material to coal exceeded a certain limit. The limiting proportion of inert substance was the measure of the agglutinating value of a coal. The paper contained an examination of the influence of the degree of fineness of the inert substance upon the values obtained. It was shown that the degree of fineness of the inert substance was an important factor in the test, and that the caking power of coal might be destroyed by a very small proportion of inert material of a considerable degree of fineness. Curves were quoted to show the proportion of inert material of varying degrees of fineness a particular coal could sustain, and still yield coherent coke. The curve varied in form for different coals, and had been called the "agglutinating curve;" it being suggested that the form of the curve might be an additional means for indicating the type of coke a coal would produce when it was carbonized. Pulverized electrode carbon, it was said, was one of the most convenient substances to use as the inert substance when carrying out the test.

In the course of his reply to the discussion, Captain Sinnatt said that the manner in which they carried out the test was by the standard American method. One gramme of coal was mixed with so many grammes of inert matter of a certain degree of fineness. They then took one gramme of the mixture and carried out the standard American method. The coal was heated for exactly seven minutes, and the volatile matter came off in 40 to 80 seconds, when heated over a full bunsen burner. To test the friability of the coke, they took out the button from the crucible, and placed on it a 100-gramme weight of the area of the button. When the coke was completely crushed, the test was finished.

COLOUR-MATCHING BY ARTIFICIAL LIGHT.

The subject of colour-matching by natural and artificial light was dealt with by Mr. L. C. Martin, D.I.C., A.R.C.S., B.Sc. (Lecturer in the Optical Engineering Department of the Imperial College of Science and Technology), in a paper which he read before the Illuminating Engineering Society on Jan. 27.

Lummer and Kurlbaum, he said (who have studied the effects of increasing the temperature on the spectrum of a "black body" or perfect radiator), have shown that the position of maximum energy in the spectrum tends to shift into the regions of shorter wave-lengths as the temperature rises. The radiation of the sun corresponds approximately to that from a black body at 5000° C. —a temperature at present impossible on the earth in any of our artificial illuminants. Certain substances, however, possess the property of radiating a greater proportion of energy in the shorter wave-lengths than would be emitted by a perfect radiator. Thus, in spite of the fact that the temperature of an incandescent gas-mantle is, comparatively speaking, not very high, mantles of certain composition radiate light which appears green or blue compared to the light from other artificial sources; and he has been told that incandescent gas is more satisfactory for painting at night than electric lamps. There was discussed, among other matters, the production of artificial daylight from gas-filled lamps in connection with which the author mentioned the fact that in 1914 Ives and Brady produced a glass for accurate colour-matching with the Welsbach lamp. Mr. G. A. Sheringham has for some time made use of a single-tinted reflector in conjunction with an ordinary electric lamp, for improving the quality of the light, and has stated that he has been able to paint quite successfully at night-time by this means. The reflector was covered by washes of about equal areas of green and violet inks, and used with a metal filament lamp as a "shade." In view of the importance of the subject in colour work, it was referred to the Technical Optics Department of the Imperial College for investigation. Mr. Martin referred to facts which preclude the hope of any general satisfactory lighting by a single reflector alone, but added that, by the use of intensive or semi-intensive reflectors concentrating a relatively great amount of reflected light, we shall be able to produce a quality of light at certain points very much more nearly approximating to daylight quality than the bare light alone. It is alternatively possible to reflect the whole of the light from a tinted surface, and, granted that pigments of correct properties are available, the excess of the longer wave-lengths can be entirely absorbed, and thus the entire illumination can be corrected. The possibilities in connection with other sources of light are now being considered. Incandescent gas offers problems with the arrangement of ventilation, &c., for reasonable efficiency; but the correction need not be so drastic, as the energy distribution is more favourable.

REGISTER OF PATENTS.

Production of Ammonium Salts.—No. 137,345.

CURPHEY, W. S., of Canfield Gardens, N.W.

No. 13,596; Aug. 21, 1918.

This invention relates particularly to the manufacture of sulphate of ammonia.

The patentee remarks that, in the manufacture of ammonium salts from crude ammoniacal liquor by the ordinary process of distillation, in the earlier stages of the treatment of the liquor sulphuretted hydrogen and other impurities are driven off, while subsequently the ammonia expelled from the treated liquor is relatively purer. It has been proposed, with a view to producing sulphate of ammonia free from the impurities normally present in the ammoniacal liquor, to introduce the latter into a still of the character of a Coffey's still—that is to say, a tower provided with a plurality of diaphragms which divide it into a number of chambers, into each of which the gases and vapours from the lower chambers are discharged and from each of which the liquor discharges into the next lower chamber—this tower being provided with a gas and vapour discharge pipe at its upper portion, and a second gas and vapour discharge pipe at a lower level; the first-mentioned pipe being arranged to discharge gases into a body of acid liquor, and the second pipe to discharge gases into a second body of acid liquor.

With this arrangement, while relatively pure ammonia may be discharged by way of the pipe at the lower level, a considerable proportion of the ammonia evolved in the chambers below the pipe will pass upwards and be discharged (together with the impurities) through the pipe at the higher level.

In connection with this proposal, it was stated that should the ammoniacal liquor contain ammonia in such form as cannot be volatilized with steam heat alone, caustic lime is added to the ammoniacal liquor in the lower chamber of the still.

When producing by the process ordinarily practised the mixed product containing sulphite and sulphate of ammonia, known as "Burkeiser Salt," which is formed by the combination of a sulphurous acid and ammonia, the product often is contaminated to a serious extent with sulphur, due to the reaction between the sulphurous acid and the sulphuretted hydrogen; and the product is liable to contain traces of free acid, which also depreciates its commercial value. When, on the other hand, sulphuric acid containing arsenic is employed for absorbing ammonia derived from gas liquor, the product will contain sulphide of arsenic, due to the precipitation of the arsenic by the sulphuretted hydrogen, and also the product may be discoloured by tarry impurities, which will also be present even if sulphuric acid free from arsenic is used, and the saturation of the acid with ammonia is conducted in the usual manner.

According to the present invention, the saturation of the acid liquor is effected in two stages. In the first, a proportion of ammonia containing sulphuretted hydrogen and other volatile impurities arising from crude ammoniacal liquor is caused to react with an acid liquor—the residual gases being led away. In the second, the product of the aforesaid treatment of the acid liquor, after being filtered or otherwise treated to effect the removal of precipitated bodies, is treated with relatively pure ammonia arising from the further treatment of the ammoniacal liquor in such manner as to effect the separation of an ammonium salt free from impurities—such as sulphur, sulphide of arsenic, tarry matters, and the like—and preferably also free from acidity.

The product of the first stage of the treatment of the acid liquor may, without the addition of further acid, be treated with ammonia free from impurities derived from the further treatment of the ammoniacal liquor, or it may, with the addition of further acid, be treated with ammonia free from impurities derived in the manner indicated.

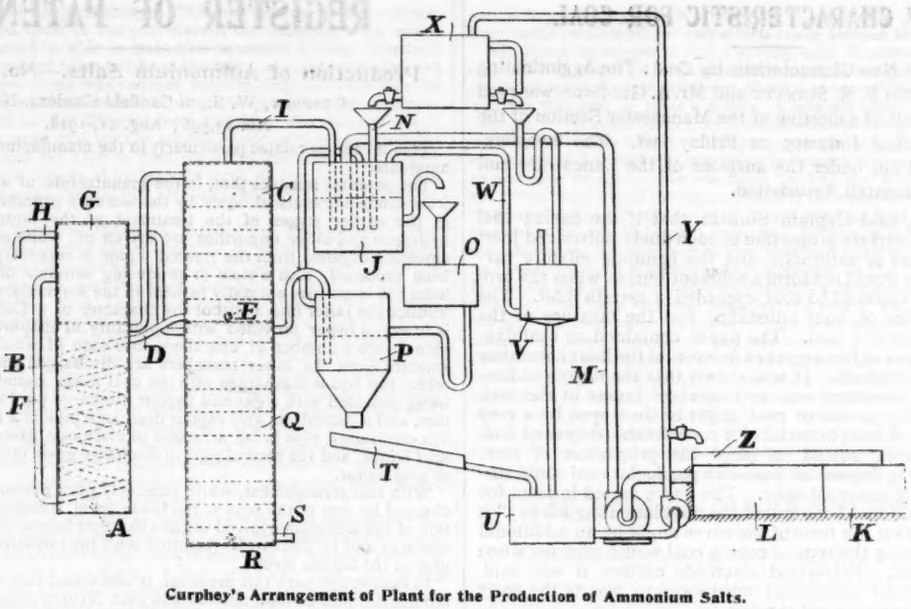
Thus the acid liquor employed in the first stage may be a solution of sulphuric acid free from sulphurous acid or bisulphites, and the acid liquor employed in the second stage may consist almost entirely of a solution of sulphurous acid or bisulphites containing, however, the acid product of the first stage—the acid liquor employed in the second stage being, as indicated above, treated with ammonia free from impurities derived from the further treatment of the ammoniacal liquor.

When an arsenic containing sulphuric acid is employed in the first stage, and the employment of this grade of acid is desirable on account of its lower cost, the sulphuretted hydrogen will perform a useful function—namely, the separation of the arsenic from acid; while in the second stage a mixed sulphite and sulphate of ammonia may be produced.

In carrying the invention into effect, the ammoniacal liquor may be first heated in order to drive off a portion of its contained ammonia, together with the sulphuretted hydrogen, carbon dioxide, and at least part of the volatile organic impurities; and the residual liquor may be then treated with lime to facilitate the expulsion of the residual ammonia.

When producing a mixed sulphite and sulphate of ammonia (such as is known as "Burkeiser salt") employing an acid liquor containing sulphurous acid or an acid sulphite for absorbing the ammonia produced in the first stage of the treatment of the gas liquor, the sulphuretted hydrogen contained in the impure ammonia will react with the sulphurous acid or acid sulphite, causing sulphur to be precipitated, while at the same time the organic impurities contained in the gas will, at least in part, be thrown down; the residual gases from this treatment being led away and being optionally subjected to such further treatment as may be deemed desirable. The partly neutralized liquid thus produced, after the removal of the precipitated matter, is treated with relatively pure ammonia produced, for instance, by the addition of lime to the ammoniacal liquor which has been treated for the production of the ammonia used in the first stage of the process; and in this way there will be obtained a neutral salt free from sulphur and other impurities.

Apparatus in accordance with the invention comprises two distillation



Curphey's Arrangement of Plant for the Production of Ammonium Salts.

vessels so combined as to form a two-stage still; a device in which lime is introduced into the partially exhausted ammoniacal liquor; means for causing the liquor to pass successively through the first distillation vessel, through the device referred to, and through the second distillation vessel; means for passing the gases evolved in the first distillation vessel into an absorber; means for introducing into the absorber the bodies adapted to supply the acid constituent of the salt; means for withdrawing the solid and liquid contents of the absorber; a filtering device adapted to treat the material withdrawn from the absorber; a second absorber; means for introducing into the second absorber the acid liquid from the filtering device, and for introducing the ammonia containing gases produced in the second distillation vessel; means for treating the contents of the second absorber, in order to remove the precipitated salts and a draining device for the salts; and means for collecting the drainings from the salts, and preferably transferring the liquids to a tank adapted to deliver its contents to the first absorber. If desirable or necessary, a catch tower may be employed to effect the absorption of any sulphurous acid which escapes combination in the first absorber, in which case the liquid descending the catch tower is conveniently collected and returned, together with the drainings from the salts, to the first absorber or the catch tower.

When the apparatus is designed for the production of a mixed sulphite and sulphate, the means for introducing into the first mentioned absorber the bodies adapted to supply the acid constituent of the salt will comprise means for introducing gases containing oxides of sulphur; and in this case means may also be provided for introducing gases containing oxides of sulphur into the second absorber.

When designed for the production of ammonium sulphate by the employment of sulphuric acid alone, the apparatus will be similar, except that the means for the introduction of sulphur dioxide into the liquid contained in the absorbers in which the reaction between the sulphuric acid and the ammonia is conducted will be omitted.

When employing sulphur dioxide in accordance with the invention, the supply of this gas may be obtained by the combustion of sulphur or other suitable sulphur-containing bodies; and the heat derived from this operation may be made use of for evaporating any accumulating liquors.

By way of example a diagram of the apparatus is given. A is the inlet for the crude ammoniacal liquor to the heat exchanger B. A pipe leads the heated liquor therefrom to the distillation vessel C, downward through which the liquor passes, leaving by the pipe D. The vessel C is heated by steam introduced at E. The liquor, after a proportion of ammonia has been driven off, leaves the vessel C by the pipe D, and passes through the coil shown on its way to the pipe F, which conducts it to the vessel G, into which milk of lime is introduced by the pipe H. The ammonia evolved in C passes, by the pipe I, into the absorber J, into which also gases containing oxides of sulphur produced in the burner K are led through the flues L and pipes M by the aid of the fan shown. Liquid is introduced into the absorber by the pipe N; while the reaction mixture produced in the absorber is transferred to the filter O. The filtrate passes therefrom to a second absorber P, into which ammonia is introduced from the second distillation vessel Q which is fed with liquor from the vessel G, being heated therein by steam introduced by way of the pipe R; the spent liquor being discharged from the distillation vessel by the pipe S.

The crystalline salt produced in the saturator P is separated from the mother liquor by the draining device T, the drainings from which pass into the tank U, which also receives the wash liquor from the catch device V, into which the gases which are not dissolved in the saturator J are passed by the pipe W, such gases escaping to the atmosphere after treatment therein. The treatment liquor introduced into the catch tower may be the drainings collected in the tank U which are elevated by a pump into the tank X, which is arranged to deliver liquid to the absorber J, as well as to the catch device. A side tube (provided with a stop cock) is arranged on the pipe Y, so that the liquid collected in the tank U may be transferred to the pan Z, where it may be evaporated by the waste heat from the burner K, in conjunction with which is a suitable arrangement of flues L to ensure the desired transference of heat.

For preventing loss of ammonia, a pipe connection is arranged between the absorbers P and J, so that any ammonia escaping combination in the former will pass to the latter.

Attaching Brackets to Gas-Pipes.—No. 137,461.

SPENSERS, LTD., and SMITH, H. E., of South Molton Street, W.

No. 12,036; May 13, 1919.

This invention has for its purpose to enable fittings to be made more ornamental than hitherto by avoiding the usual circular back plate and wood block commonly employed and the use of a coned and channelled plug by which a box or socket receiving the burner supply pipe is attached and connected to the gas-main.

Cement for Fire-Clay Retorts.—No. 137,419.

M'MINN, S. A., Beckton.

No. 5075; Feb. 28, 1919.

This cement for lining the interior surfaces of fire-clay gas retorts is an admixture of ground or powdered glass with fire-clays ordinarily in use. Preferably the percentage does not exceed 50 p.ct., and is governed by the quality of the ground glass obtainable. If of good quality and free from flint, 33 p.ct. is quite suitable; but if the ground glass contains flint or other foreign matter, the quantity used is increased to (say) 42 p.ct. For use where higher temperatures obtain (as in the furnaces and combustion chambers of retort-settings), the cement proposed is a mixture of silica clay—*i.e.*, clay containing over 90 p.ct. of silica—with china clay and ground glass, in approximately equal proportions. In any case, the cement is applied to the retorts, either old or new as described, or it may be applied to the retorts before they are fired in the process of their manufacture.

The fire-clay is first well mixed dry in a mill with the required proportions of powdered glass. The composition is then mixed to the required consistency with a sufficient quantity of clean water, so as to form a plastic mass, which is applied when the retorts are cold—being rendered on them by a bricklayer's trowel to any required thickness. After the heats are raised to a temperature of (say) 1700° to 2000° Fahr., the cement adheres firmly to the retort and sets hard.

The patentee remarks: "I am aware that it has been previously proposed to manufacture refractory bricks and fire-clay substitutes from waste glassmakers' sand, containing a proportion of glass grindings bound with aluminous materials. I find, however, that with such a mixture it is not possible to form a glazing cement such as I propose, owing to the small proportion of glass present. I am also aware that it has been proposed to form a cement for lining gas-retorts, by the admixture of refractory earths and 25 p.ct. of soda or its equivalent, with the object of uniting the cement to the retorts and forming a vitreous coating. But the glazing action of such cement depends upon the chemical combination of the alkali with the refractory earths, and is not in substance what I claim. I am further aware that it has previously been proposed to form a non-shrinking cement for caulking gas-retorts, using glass refuse or pottery refuse with fire-clay, iron and steel borings, and furnace slag. But such a cement is not suitable for glazing purposes; and the inventor of it recommended that a suitable glazing composition should be applied after the application of his cement."

Supply of Gas to Stockton.—A letter from the Woodall-Duckham Company was read at last week's meeting of the Stockton-on-Tees Town Council, stating, in regard to the installation of vertical retorts at the gas-works for which they had tendered some time ago, that a certain sum would now have to be added, if the work was to be proceeded with. The Town Clerk reported that the Gas Committee had interviewed representatives of the successors to the Otto Coke-Oven Company respecting a supply of coke-oven gas for the town; and a report upon cost and other details was being prepared.

MISCELLANEOUS NEWS.

THE GAS LIGHT AND COKE COMPANY.

The Two Hundred and Thirteenth Ordinary General Meeting of the Proprietors was held last Friday, at the Chief Office, Horseferry Road, Westminster, Mr. D. MILNE WATSON (the Governor) in the chair.

The SECRETARY (Mr. W. L. Galbraith) read the notice convening the meeting; and the seal of the Company was affixed to the "Register of Proprietors."

THE GOVERNOR'S ADDRESS.

Ladies and Gentlemen,—I presume that you will agree to take the report and accounts as read. The year that has just passed has been a record one in the Company's history, as you will realize when I point out to you that the output of gas has been 30,509 million cubic feet—a figure far in excess of any previous year—and our income only about £150,000 short of £10,000,000. As I unfold the story of the Company's work, I shall have something more to say with regard to these figures. In the meantime, I give them so that the shareholders may realize in some degree the magnitude of the Company's operations during the past year.

EXPENDITURE AND REVENUE.

Dealing with the capital account of the Company in the first place, you will notice that we have spent £392,877, of which £247,774 has been incurred under the heading of "Buildings and Machinery in Extension of Works." This item includes a large expenditure in respect of ships. We have also expended £64,544 on new and additional mains and service pipes; £24,937 on new and additional meters; and £55,623 on new and additional stoves. Against this expenditure, we have certain credits—£11,801 by the sale of surplus lands; £137,053 in respect of stoves recently sold; and £130,358 from the depreciation of meters and stoves—leaving a net expenditure of capital for the year of £111,164.

Turning, now, to the revenue account, you will find some very striking figures. Coal has cost £4,033,769, or nearly a million more than last year. Oil cost £382,879, or about £100,000 more—due to the fact that the Company had to use large quantities of oil to meet the record demand for gas. And as you go through the figures you will find that there is an increase under practically every heading—partly due to the increase in costs and partly to the increase in business. It will be noticed that the wages have again gone up by a large amount. In 1918, the wages bill was £1,862,194; last year, it was £2,605,779—an increase of £743,585. This figure, large as it is, will probably be exceeded in the present year, inasmuch as the Industrial Court, after having held an arbitration, recently awarded another 5s. per week to men employed in the gas industry. This will mean a further addition of nearly £200,000 per annum in the case of this Company.

On the credit side of the account you will find that gas has brought in about £1,200,000 more than in 1918. This is partly due to the increase of 15½ p.ct. in business, and partly due to the rise in price. The rental of meters and stoves yielded practically the same amount as in 1918. The rental of fittings, however, shows a satisfactory increase of about £85,000. Coke has produced an increased income of £750,000; breeze, of £55,000; and ammoniacal liquor, of £40,000. Tar and tar products, on the other hand, show a decrease of £48,000, which is due to the lower prices obtained for certain of our products.

Unfortunately, the enormous increase in the Company's business is of no advantage to the shareholders. As the report states, the dividend—under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918—is at the rate of 3 p.ct. per annum, which is the same as was declared this time last year. After this dividend is paid, there will be a balance to carry forward of £323,971, or £56,773 less than from the previous account.

A RECORD GAS OUTPUT.

With regard to the output of gas, the Company, as I have already mentioned, have established a new record, having sold over 30,000 million cubic feet of gas. This increase is, no doubt, due principally to the fact that the restrictions which were in force during the latter part of the war have now been removed, and to the fact that many householders have had great difficulty in obtaining coal. The extra quantity of gas sold during the year amounts to over 4000 million cubic feet, or enough to supply the whole of Newcastle-upon-Tyne for one year. Since the close of the year we have also had a record output for any one day—viz., 141 million cubic feet. Naturally, this enormous increase in business is taxing the Company's resources to the full; and it has been extremely difficult at times to keep up the supply of gas. But, fortunately, we have been able to carry on throughout the whole of this winter without on any occasion reducing the pressure of the gas supplied. When it is realized that during the past five years we have hardly been able to do any reconstructional work, and that we have been obliged to make gas from plant which has only, so to speak, been patched-up during the period of war, I think you will agree that the manufacture of this extra quantity is something of which the Company may very well be proud. How many people realize the task the Company have had to face in having to provide for an additional demand for gas equal to the total demand in Newcastle for one year? Those who are inclined to criticize would do well to remember that during the five years the country has been at war, the Company, like other gas undertakings, have been unable to enlarge, or even keep their works up to standard; and during the past year we have had to meet a maximum demand from the public for gas with plant that is in many cases almost worn-out. The cost of repairs and maintenance of plant has been very large; but, when taken in conjunction with what I have just said, it is easily understood. It must be remembered that the whole world is clamouring for materials of all kinds, and that labour is very costly and not easy to obtain. Repairs have had to be postponed for some five years; and it is absolutely necessary now to proceed with the work as quickly as possible.

During the past year, the Company used 2,082,000 tons of coal, which was not only very difficult to obtain, but was much inferior in quality to the coal which we were accustomed to use before the war. We have been forced to take coals which we should never have previously thought of buying; and our usual descriptions have frequently contained an abnormal quantity of dirt.

THE COMPANY'S FLEET.

As I have already mentioned, ships represent one item in "Buildings and Machinery in Extension of Works" in the capital account. The Directors have, owing to the high prices of freights for coastwise traffic, decided to increase the number of the Company's colliers; and we are accordingly building six additional boats, which will save the Company, it is hoped, a great deal of money in the near future. You will realize what this means when I tell you that the seven boats owned by us at present (some of which are old and quite unsuitable for our trade) cost us on an average during the last six months only 6s. 6d. for every ton of coal carried. This includes insurance, wear and tear, interest on capital, depreciation, and all running expenses; whereas the owners from whom we have to charter in the open market at the present time ask freights of 12s. 9d. for large and 17s. for small boats.

STOVES—PURCHASES BY CONSUMERS.

A good deal of attention has been directed recently to the increase in the charge for the hire of stoves. It was becoming apparent that, owing to the cost of repairs and renewals having doubled, the charge for rents of meters and stoves was not sufficient to cover expenses; and the Company were, therefore, losing heavily. Since the Company started letting stoves out on hire, the total rents received have amounted to a million-and-a-half pounds; while the cost of repairs—without taking into account interest on capital outlay and the provision of a sinking fund—has amounted to over two million pounds. The Company decided that it was not fair to allow the additional cost to fall on the price of gas, as this would place an unfair burden on those consumers—and they are very numerous—who have purchased (and therefore maintain in repair) their own stoves, and also on the automatic consumers who would have to bear, in the shape of an extra charge for gas, any loss incurred by the Company supplying stoves to ordinary consumers at too low a rent. It was felt that the stoves should, as much as possible, be made self-supporting; but, in order that no consumer should consider that he was forced to pay the higher rental, it was decided to give him the option of purchasing any stove on his premises at a reasonable figure. This offer has been much appreciated; and about 100,000 stoves have been sold up to date. The result to the 31st of December last, so far as the capital account is concerned, is, as I have already mentioned, a credit of £137,000.

Naturally, the whole question came before the various bodies investigating charges of profiteering; and the Company were called before several of these tribunals, and were also requested by the London County Council to explain the necessity for increasing stove-rents. I am glad to say that in all cases we have been entirely acquitted of the charge of profiteering.

COAL PRICES—A REBATE TO GAS CONSUMERS.

As you will see from the report, we started the year (1919) with the price for gas at 4s. 4d. Owing to a reduction in the price of oil, and to slightly lower freights which followed the armistice, the Directors found themselves able to reduce the price to 4s. 2d. in April, thereby giving the consumers the earliest possible benefit of the savings effected. Unfortunately, however, towards the end of July the Government raised the price of coal by 6s. per ton, which made it quite impossible for the Company to continue the price of gas at 4s. 2d.—especially as there were several other unfavourable factors which had to be taken into account. The result was that the Board, with great reluctance, were compelled in October to raise the price to 4s. 8d. High as this price may appear to be, it represents only an increase of 87 p.ct. over pre-war price, whereas our principal costs have risen by much larger percentages—coal, 116 p.ct.; oil, 340 p.ct.; freights, 325 p.ct.; and wages, 145 p.ct. In November last, it began to be rumoured that a reduction in the price of coal was about to be made; but the whole country was startled a little later when it was announced that the domestic price of coal had been reduced by 10s. per ton. So far as gas undertakings are concerned, it has been arranged that the reduction of 10s. on the coal required for the manufacture of gas used for domestic purposes should be handed on to consumers in the shape of a rebate on the gas supplied. The rebate, in the case of this Company, I have the pleasure to inform you, will be at the rate of 7½d. per 1000 c.ft. This is subject to adjustment as time goes on, should our actual experience not warrant such a figure.

ANOMALIES OF THE COAL PRICES ORDER.

I should like to point out that the rebates allowed by individual undertakings will vary considerably, inasmuch as those which make partly water gas will not get an allowance from the Government on the raw material used in that portion of their manufacture, as such raw material is, of course, not coal.

It would have been better, in my opinion, if some general average reduction had been made on all coal supplied, as it is very difficult to distinguish in many cases between gas used for domestic purposes and gas used for industrial purposes, as you will see, for instance, when I point out to you that shops, theatres, hotels, railway stations, and churches are considered by the Coal Control Department to be domestic, whereas laundries and bakeries are not.

Another point must be borne in mind—namely, that this differentiation in the price of coal interferes with the principle of the sliding-scale, which was based on the price of the gas supplied to the general body of the consumers. Now we have this anomaly—some 90 p.ct. of our consumers use gas for domestic and 10 p.ct. for industrial purposes. Yet the sliding-scale is apparently now regulated, not by what is charged to the general body of the consumers (that is, the 90 p.ct.), but by what is nominally charged to the 10 p.ct.—namely, the industrial gas users. This is an artificial complication which strikes at the basis of the sliding-scale as originally applied.

SLIDING-SCALE REVISION.

As you are all aware, the most important question with which the industry is faced at the present time is the revision of sliding-scales

or maximum prices, as the case may be. As you know, under the sliding-scale, the shareholders in this Company received a dividend before the war of £4 17s. 4d. p.ct., after a certain payment had been made to the redemption fund. This dividend was reduced, owing to the increased price of gas, to £2 18s. 8d. p.ct. A strong appeal was made to Parliament, with the result that the Statutory Undertakings (Temporary Increase of Charges) Act was passed in 1918, which enables the Company to distribute a dividend of 3 p.ct. This relief is to last for two years after the war; but it has become perfectly clear that if the shareholders are not to be ruined, something further must be done, and that not as a temporary measure only. When the Temporary Increase of Charges Act was before Parliament in June, 1918, this fact was fully admitted by the then President of the Board of Trade, Sir Albert Stanley (now Lord Ashfield), who considered that, although temporary relief should be given for the time being, yet after the war, when we might probably be living in a new world, it would be necessary to reconsider the basis of the sliding-scale. Bearing this in mind, and seeing that the financial position of the gas industry was going from bad to worse, it was decided to remind the Government of their promise. Accordingly, a deputation, of which I was a member, waited upon Sir Auckland Geddes, the present President of the Board of Trade, in July last, and laid the whole case before him. We were sympathetically received, and he said in effect that the importance of the industry was fully recognized, and that clearly steps must be taken in some direction which would make it possible for the industry to carry on and develop; otherwise, if it did not develop, it must go backward. The Board of Trade were fully alive to the importance of the gas industry and to the need for seeing that it was not pushed to the wall.

Since this statement was made by the President of the Board of Trade, the Government have promised to introduce a Public Bill during the coming session of Parliament to deal with the financial position of the industry; and this will, of course, affect the Company as well as others. We are now awaiting with the greatest possible interest the introduction of the Bill, which, however, owing to the extensive Government programme, we do not expect before Easter.

I need hardly point out to you of what vital importance it is to the industry that the existing sliding-scale should be revised. To show how desperate the position is, as soon as the Temporary Increase of Charges Act comes to an end, this Company will only be entitled, if it should still be able to sell its gas at 4s. 8d. per 1000 c.ft., to pay a dividend of £1 12s. p.ct. per annum, with the prospect that even this miserable dividend will fall if the price of gas has to be still further advanced. In order that you may fully realize the position, I should like to give you some figures showing how our great industry has been affected. The capital invested in gas undertakings (other than municipal) is roughly computed to be £100,000,000; and the depreciation of this capital since 1914, judging by the experience of a number of the very large companies, is estimated at no less an amount than £43,000,000. In the case of our own Company, the loss amounts to as much as £10,000,000, or nearly 40 p.ct. of the market value of our stock in 1914.

With regard to fresh capital, no industry can go on unless fresh capital can be raised; and from the story I have told you of the extraordinary increase in business you will realize that, gas being required by the public in large and increasing quantities, further capital is absolutely necessary for development.

CAPITAL RAISING DIFFICULTIES.

I recently heard of a gas company which tried to raise capital by the issue of £20,000 of 6 p.ct. debenture stock at the reserve price of par, with the result that only £600 was applied for. And this need not be wondered at when the Government offer 5½ p.ct. with the credit of the nation behind it. Not only are the shareholders interested—and I should like at this moment to tell you how the shareholders are affected, because it is a thing that ought to be known.

A PITIFUL LETTER.

Only this morning, I received a letter addressed to the Governor and Directors of the Gas Light and Coke Company, from the country. I will not tell you where it came from. It begins:

5th Feb., 1920.

> Sirs,—In your latest report, it is stated that the Government have promised to introduce a Bill to deal with the financial position of gas undertakings, and "it is hoped that the shareholders of this Company will then obtain much needed relief."
>
> I hope something will be done by someone to help us. My mother is a widow, not young, and with no sons to assist her. Her little money, £775, was all invested (for her support) in the Gas Light and Coke Company. The cruelly low dividend of £3 p.ct., brings her "income" down to less than 10s. per week! You cannot think what a struggle we have to live. If the Company can afford to spend over £21,000 for "stationery and printing," can they not spare a little from their War Distress Fund to help my mother in the state of poverty she has been reduced to? A coal bill is owing. We will have to sell something to pay; and prices rising. What will become of us? I implore you to help us a little. Ours is such a cruel case. The pre-war dividend was not high; but now so much less, and prices up. Why should the wretched gas shareholders have to suffer so? They ought to get a decent return for their money. Oh, if you only had to live as we do, you would understand.

I think that letter speaks for itself. For people to be reduced to that through no fault of their own is a scandal. ["Hear, hear."] Consumers and workers are also interested. They will suffer in the long run if the gas undertakings cannot raise capital through being financially crippled. Because gas undertakings are able to carry on at present, it may not be apparent to some persons that there is cause for anxiety; but sooner or later the crisis will be bound to arrive, and in some cases very shortly. I believe the Government fully realize this, and are prepared to do justice to the gas industry. I would appeal, therefore, with the greatest earnestness to Parliament to assist the industry out of the grave difficulties in which it finds itself. Many local authorities are alive to the seriousness of the position, and those who are themselves suppliers of gas are pressing for a revision of their financial conditions. I would further also appeal to the shareholders individually to do everything they can to educate the public generally as to the urgent need there is for Parliament to assist the industry in this crisis in its affairs. No doubt, it will be represented that this is an attempt on the part of capital to get more than it ought to have; but let it be remembered that the terms of the present sliding-scale were settled when conditions were entirely different from those which exist to-day. Local authorities have never in the past hesitated from pressing for modification of sliding-scales, which they considered justified by alterations for the better in the conditions of the time; so why should they oppose modifications now that the circumstances are changed for the worse—especially as any legislation will, no doubt, be accompanied by safeguards for the future? Shareholders in public utility undertakings should not have their dividends reduced to vanishing point, and the value of their stock depreciated to the extent already indicated, through no fault of their own, and at a time when business is increasing by leaps and bounds.

The gas industry is singular in several respects, and is probably the only industry in which a serious attempt has been made to solve two of the great problems with which we are face to face at the present time. First, as to the relationship between the buyer and seller. The sliding-scale was originally an experiment, and up to the time of the war was a great success, safeguarding the interests of both consumers and shareholders. Dividends were increased when the price of gas was lowered, and reduced when the price was advanced. This principle of mutual interest between buyer and seller worked admirably in normal times. But if the result of its application is practically to extinguish dividends, and it is not to be subject to modification when circumstances clearly prove that it acts altogether inequitably (as is the case at present), it will be considered to have completely failed; and it is quite certain that no other industry will be prepared to adopt such a principle.

The auction clauses, which also are peculiar to this industry, with the exception of the water companies, provide that all new stock shall be offered for sale by auction or by tender to the public so as to ensure the best price being obtained for it; and any money that is received in excess of the nominal amount of stock issued is used by undertakings for capital purposes without it incurring any charge for interest.

The sliding-scale and the auction clauses embody two great principles which might well be applied to other industries, and would automatically prevent what is called profiteering; and therefore it is of the greatest importance that an industry which has adopted both those principles should not be brought to such a financial pass as would deter any other industry from accepting similar conditions in the future.

CAPITAL AND LABOUR.

The second problem is the relationship between capital and labour. The gas industry has done a great deal to solve this problem by adopting the principle of co-partnership. The present co-partnership scheme of this Company provides that the man's labour be regarded as his investment in the Company—just as money is the investment of the ordinary shareholder—and the bonus paid to the worker is, therefore, calculated at the same rate per cent. as the dividend paid to the Company's ordinary shareholder. By this means there is complete parity of interest between the worker and the shareholder—each benefiting or suffering alike. At present they are both paid 3 p.ct. If this principle were only adopted in other industries, I feel sure it would go a long way in helping to solve the industrial unrest at the present time. Therefore, I again make the appeal that this industry, which stands for the automatic control of profits and for giving the workers a share in the business, should receive fair play. All we ask for is justice.

THE BEILBY REPORT—A NEW CHARTER FOR THE INDUSTRY.

When the Government introduce legislation dealing with the financial position of the industry, it is almost certain that they will at the same time embody in their Bill provisions with regard to the quality and sale of gas. As is probably known to you all, the Fuel Research Board, presided over by Sir George Beilby, carried out recently an inquiry into the question of the quality of gas to be supplied in the future, and other cognate matters. Representatives of the gas industry met the Fuel Research Board, and thoroughly discussed the whole question. The Fuel Research Board came to the conclusion that it was impossible, having regard to the various circumstances under which gas undertakings were working, to lay down any hard-and-fast rule as to a general calorific standard. After many meetings between the Fuel Research Board and representatives of the gas industry and the public, it was agreed that certain recommendations should be made to the Board of Trade.

(1) That in future gas should be sold by heat units rather than by cubic feet.
(2) That each undertaking should have the right to declare the calorific value of the gas it intends to supply.
(3) That gas should not contain above a certain proportion of "inert" constituents; and that it should be supplied at a certain pressure.

In agreeing to these conditions of supply, the industry will be submitting itself to more stringent regulations in some respects than heretofore; but it will accept them willingly if, at the same time, it obtains relief from its financial troubles.

The proposal that gas undertakings are to be allowed liberty to decide the calorific value of the gas to be supplied by them will not injure the public in any way, seeing that the public will only be called upon to pay for the heat units actually delivered to them. When all these matters are embodied in a General Act, it will constitute a new charter for the gas industry.

GAS AND COAL CONSERVATION.

In April of last year, a very important report was issued by Sir Dugald Clerk, Prof. Cobb, and Prof. Smithells jointly, on the relation of the gas industry to coal conservation. In the report it was shown, among other things, that the maintenance and development of the gas industry are essential to the country from the point of view of fuel conservation, and particularly that gas is the most effective form of

utilizing the heat in the coal. It is a report of very great value, and it is hoped that it will be widely studied and serve to correct some of the misapprehensions which exist on the subject.

THE NATIONAL GAS COUNCIL.

At the last meeting, I informed the shareholders that gas undertakings were in process of forming a National Council for the purpose of enabling the industry to take united action in matters concerning their welfare. I am glad to say that the Council has been formed and is finding plenty of useful work to do for the industry; and I feel sure that it has a great *rôle* to play in the future.

FEDERATION OF EMPLOYERS.

The industry has also set up a Federation of Employers to deal with labour questions. In this connection, I am pleased to say that we have formed a Joint Industrial Council for the industry on the lines of the Whitley scheme. This I am sure will have a good effect in bringing employers and employed into closer touch with one another—enabling them to appreciate each other's points of view better.

EMPLOYEES AND THE COUNTRY'S CALL—A WAR MEMORIAL.

As you will see from the report, we are now in a position to give almost the final figures in regard to those of the Company's employees who joined His Majesty's Forces. The corrected total is 5363, of whom 60 are known to have won distinctions, and 77 to have obtained Commissions. I regret to say that 506 were killed or died on active service. With the exception of about 400 who are still serving, those who joined-up have now been demobilized, and (as promised) employment has been found for all who wished to return to the Company's service.

As the best form of war memorial, the Directors have decided that, after the names of those who served have been recorded in some permanent form at each office or station, a war memorial fund shall be instituted, which will be available to assist the Company's employees and their dependants in cases of necessity which cannot be dealt with in the ordinary way. It is proposed, and indeed the co-partners have already agreed, that the capital of the existing war distress fund should be transferred to the war memorial fund, and that the Company should also contribute to the fund to make it a worthy memorial.

APPRECIATION OF THE STAFF'S SERVICES.

I should again like to express to the staff the appreciation of the Board for the whole-hearted services given by them, from the highest to the lowest, during another very difficult year. The majority of the women who so worthily filled the gaps during the war have now left; and I wish to place on record the Company's thanks for the services they rendered.

Although the outlook is full of difficulty, yet so far as business is concerned it is full of promise—both with regard to our main product, gas, and our residuals; and if only we obtain from Parliament the much-hoped-for relief from our financial troubles, the prospect for the future may be said to be bright.

I now have pleasure in moving:

> That this meeting do agree with and confirm the report of the Directors and the Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 29th ult.

But before putting the resolution to the meeting, I shall be happy to hear any remarks which proprietors may wish to make, and to endeavour to answer any questions they may ask.

When the Governor resumed his seat at the conclusion of his address there was loud applause from the large body of proprietors present.

The DEPUTY-GOVERNOR (Mr. H. J. Waterlow): I have very much pleasure in seconding the adoption of the report and accounts.

AN APPEAL.

Mr. R. WOODWARD: I should like to congratulate you on the speech you have just made. I do not think anyone could have put before us the present position of our Company and of the gas industry generally in a clearer or more admirable manner. As you have said, all we require is justice. Are we going to get it? I doubt it. I doubt it for this reason—we are too complacent; we do not make sufficient noise. Compare our position with that of the railway stockholders. They at once, when war began, had their pre-war dividend guaranteed by the Government. They certainly had their stock depreciated; but while we have had our stock depreciated, we have also had our dividend cruelly cut down. The services rendered by the gas industry have been second to none. ["Hear, hear."] In fact, it is a moot point whether, had these services not been rendered by the gas industry, the Huns would not have been here now. What use would it have been conveying millions of troops on the railway, if they were to be unprovided with high explosives, which we very largely provided them with. I consider the way we have been treated is no less than damnable. ["Hear, hear."] And when we hear such a letter as you have just read to us, it fairly makes our blood boil. The only thing for the stockholders to do is to hammer away personally at their local Members of Parliament, and try and get justice done. When the Bill is before Parliament, write or wire your M.P., and if you have any influence use it. I should like to appeal to the employees of this great concern to help us in the matter. Though it is hardly believable, the man in the street still thinks, with the price he is paying for his gas, that the Gas Light and Coke Company and the South Metropolitan Gas Company are profiteering. You cannot hammer sense into him. I do appeal to everybody—Directors, stockholders, and employees—to come together and work for the common good. ["Hear, hear."]

TAKE A HOPEFUL VIEW.

Mr. W. A. HOUNSOM: I have been looking at the Company's "Co-Partners' Magazine;" and I may remark, in passing, that it would be very useful if all the stockholders could be induced to take it in, because it gives a different standpoint from which to regard the Company's proceedings. It is very good, when you are looking at anything, to look at it, if you can, from all points of view. The January number of this magazine is a glorious one; and at the same time it is a very sad one. It gives the names of those who have served with the forces and of those who have fallen, which matter you, Sir, alluded to just now. But there is also a greeting from the Governor in the magazine, in which he quoted an old Cornish saying—"One for all, and all for one." I think that this should be the keynote of our proceedings to-day. ["Hear, hear."] Statistics are always misleading—or are frequently so; but I believe if one went over the statistics of the stockholders of this Company it would be found that a very large proportion are in the position of the stockholder concerning whom that letter was written which has just been read. ["Hear, hear."] Recollect this—that the stockholders in gas undertakings are largely composed of the investing public, people making investments in many cases to provide for the closing years of life; and it will be a scandalous thing if we do not get justice. But I want us to take a hopeful view here this morning, because there have been dark days in the history of the Company before. I well remember that in some of those dark days the late Sir Corbet Woodall took the same view—that, after all, Parliament had an inherent sense of justice. I do not believe this has gone, in spite of all the Government do at the present time. We want justice, we want right; and if this country is to go on—I do not say this Company, but if the country is to go on—you may depend upon it we shall have to get back to bed-rock principles, and that what is morally wrong cannot be commercially right. ["Hear, hear."] I should like to emphasize what has fallen from you, Sir, and from the previous speaker, as to the necessity for each one to do his or her best to educate public opinion in regard to this matter. The gas industry is a wonderful industry; and the country owes a great deal to it—a tremendous lot. If this fact could only be brought forward, it would ensure, I think, full consideration of the claims of the industry. There is one other point which I regard as satisfactory, and that is that we are going quietly forward, at the head of the industry, with this Company's work. I know there are certain companies and certain individuals who are endeavouring to rush through their own Bills, and so forth; but this Company are taking a wise course in not rushing and not being rushed. We are going steadily forward; and in doing as they have done this Company are not only studying the interests of the stockholders, and the employees, and the consumers, but they are studying the interests of all gas companies, and the interests of the nation as a whole. We want to go quietly, persistently forward, without being rushed. I am firmly persuaded that this is the right thing, whether or not for the moment it seems successful. I want this meeting not only to express, as it has already expressed, its appreciation of the address from the chair, and of the work that has been done during the past year, but also to give to the Board itself, in so far as is possible, every encouragement in going quietly and persistently straight ahead. That is what we want to do, without being affected by side-issues, but rather treating the industry as a whole, and recollecting the obligation which after all devolves upon us as the premier gas company to give and to maintain the lead. ["Hear, hear."] I am extremely glad to see so good a meeting. We only meet once a year; and it is well that we should have a thoroughly good one.

THE REPORT AND ACCOUNTS ADOPTED.

The GOVERNOR: If no one else has any remarks to make, I will put the motion to the meeting. It is carried unanimously.

THE DIVIDENDS.

The GOVERNOR: I will now call upon the Secretary to read the minute of the Court of Directors recommending dividends for the past half year.

The SECRETARY thereupon read from the Directors' minutes of the 21st of January the following:

> Resolved that it be recommended to the ordinary general meeting of proprietors, to be held on the 6th prox., that a dividend as follows for the half year ending on the 31st day of December last be declared, viz.:
>
> On the 4 p.ct. consolidated preference stock at the rate of . . . £4 0 0 p.ct. per annum
>
> On the 3½ p.ct. maximum stock at the rate of . . . . . £2 12 6 " "
> (subject to the approval of the Board of Trade).
>
> On the ordinary stock at the rate of . . . . . £3 0 0 p.ct. per annum
> (subject to the approval of the Board of Trade),
>
> All subject to deduction of income-tax.

The GOVERNOR: I beg leave to move the adoption of these recommendations.

The DEPUTY-GOVERNOR seconded the resolution, which was agreed to.

RE-ELECTION OF DIRECTORS AND AUDITORS.

The GOVERNOR: It is my pleasurable duty to move the re-election of the two Directors retiring by rotation—the Rt. Hon. Sir Daniel Ford Goddard and Mr. John Miles. I need hardly say anything about our old friend Mr. Miles. He has been a Director since 1898, and despite his long service is just as active as ever. He is a most valuable colleague, being full of knowledge and wisdom on matters connected with gas. Sir Daniel Goddard has been a Director for some years, and his ripe experience in gas affairs and parliamentary procedure is a great asset to the Company at the present time. I beg to move that Sir Daniel Ford Goddard be re-elected a Director of the Company.

The DEPUTY-GOVERNOR seconded the proposition, which was carried.

Sir DANIEL FORD GODDARD: I thank you for the renewed confidence you have placed in me. I hope we shall carry out all the instructions we have received to-day in regard to this great industry.

The GOVERNOR: I have much pleasure in moving the re-election of Mr. John Miles as a Director of the Company.

The DEPUTY-GOVERNOR seconded this, and it was agreed to.

Mr. JOHN MILES: I beg to thank you very sincerely for re-electing me. Though I am getting on—in fact, have got on—in years, I am still able to take great interest in the Company.

The Auditors (Messrs. J. A. Stoneham and P. H. Ashworth) were subsequently re-appointed.

The GOVERNOR: That concludes the business of the meeting.

A VOTE OF THANKS.

Mr. F. G. PILLEY: When we were here a year ago, I certainly hoped—and I think everybody present hoped—that when we had another opportunity of thanking you, Sir, and your colleagues for your services, we should also be able to congratulate you on having got into smoother water. I am afraid that hope has not been realized yet. There seems to be no end to the troubles of our great industry. We no sooner get out of one than we are in another. We no sooner get an increase in the price of coal than we get a very elusive reduction. The 10s. rebate is more elusive than the proverbial sixpence. Nobody gets any advantage, and everybody is chasing everyone else for it. I think ultimately it will have to be paid for out of the taxation of the country. It certainly does seem that we shall have to concentrate on the point that unless we get a fair dividend we cannot raise capital on reasonable terms. The gas industry lately has seemed to me rather like some big liner that has been diverted from her usual course into unknown seas. It is a very uncomfortable situation for the passengers, unless they have every confidence in the skill and ability of the captain, officers, and crew. I think no one here suffers from any nervousness in that respect where our Company are concerned. I should like to formally move a vote of thanks to you, Sir, and your co-Directors; and, if I may, I should be glad to include the officers, staff, and employees, for their services during the past year.

THE GOVERNOR AND THE SULPHATE OF AMMONIA ASSOCIATION.

Mr. FALK: I gladly take the opportunity of seconding this vote, and in doing so would like to refer to your labours, Sir, as Chairman of the Sulphate of Ammonia Association. These labours are perhaps not so well known to stockholders generally of this Company as they are to one who is, like myself, directly connected with the chemical trade. I, therefore, wish to lay before the stockholders the great work that you have done for this Company and for the country. In this work, Sir, you have had to contend, as in the case of the gas-works, with what I would venture to describe as a failing sense of justice on the part of the Government—a failing sense of justice which I cannot help feeling pretty sure will be remedied presently, when the troubles of the war and the many political disturbances connected with labour and other matters have come to an end. This country has been distinguished before all others I believe by its high sense of justice, and its magnificent and unequalled judicial system; and I cannot help feeling you will succeed in bringing Parliament to a sense of what is due to the stockholders of this and other gas companies. It was said to me by a Director of a very large gas company in another city not long ago—a man who had been a strong Liberal all his life, and was therefore to some extent a supporter of the head of the present Government—that there is no case in which the Government has so much erred from a clear and simple sense of justice as in the case of the gas companies. ["Hear, hear."] I trust that you, Sir, and your colleagues will succeed in the great efforts we know you are making for this Company.

TRY TO HELP YOURSELVES.

The vote was carried with applause.

The GOVERNOR said: I can assure you, on behalf of myself and my colleagues, that we are very much indebted for what has been said and for the kind vote of thanks that the meeting has passed to us. I can assure you it is a great encouragement in these times—which are times of unprecedented difficulty. Smarting, as we are, under the knowledge that our case has not yet received the fair treatment it ought, the feeling that at any rate here we have the loyal support and confidence of the stockholders is a very great encouragement to us. I should just like once more to say: Do try to help yourselves in this matter. The Board can do a great deal; and we are going to make tremendous efforts in the whole industry—the National Gas Council especially. But you can do an enormous amount of good yourselves, if you will only educate the public to the fact that what we are asking for is simple justice. If you will only do that, you will be doing the best work you can to help the Directors and yourselves.

BRIGHTON AND HOVE GAS COMPANY'S BILL

Approved by the Proprietors.

At a Meeting of Proprietors—held in the offices, No. 5, Great Winchester Street, E.C., last Thursday afternoon—a resolution was unanimously passed approving the Bill which is being promoted in Parliament by the Brighton and Hove General Gas Company.

The main provisions of the measure [which has already been dealt with in the "JOURNAL"] were explained by Mr. A. M. Paddon (the Chairman), who presided. He said that, though the proceedings on this occasion were formal and technical in character, the urgency which had required the promotion of the Bill was of a domestic description. The particular circumstances of the Company demanded that they should no longer delay in obtaining from Parliament the authority necessary to the carrying on of the business. It was mainly, in the first instance, a question of capital. It was now some considerable number of years since they had been able to deal with their works in the way, and to the extent, required by the supply of gas. Notwithstanding the difficult circumstances in which they had been placed, notwithstanding the arbitrary restrictions temporarily imposed upon the use of gas, the business of the Company had increased largely through the whole period of the war. Two things were now necessary. First, that they should put the gas-works in good order; and secondly, that they should adopt every form of technical improvement which would increase the efficiency of the process, and enable them to meet the enormously increased cost of labour and all other charges. These facts really explained the promotion of the Bill. But a further reason was that the Directors felt it incumbent upon them, at the first practicable moment, to make every effort they could to relieve the almost intolerable disability the proprietors were labouring under with regard to dividends.

Mr. Paddon then proceeded to refer to particular provisions. The first point with which he dealt was the raising of fresh capital. He said they were asking power to raise £100,000 of additional ordinary capital. This might seem a small amount, having regard to the future before the Company; but the Directors were most anxious to give the Bill the most moderate aspect they could, so as to avoid controversy and opposition. By clause 9, they took the ordinary power of borrowing one-third of the authorized new capital, which would amount to about £33,000. Clause 16 was to confer upon them an even more important power, for which there was every necessary precedent in the action of Parliament in the past. They there asked that, in connection with all the powers of the Company to raise capital by previous Acts, they should be similarly empowered to raise one-third as much in debenture stock. This would give them £84,000 in connection with the older powers of the Company, by which they did not raise more than one-quarter in debenture stock, and in some cases not even that. In the accounts presented to June 30 last, the Company had unexercised powers in regard to capital and debentures which would give them £132,000; and adding these amounts together—the new capital £100,000, the contingent power of borrowing £33,000, the new power of borrowing over old capital £84,000, and the unissued capital and debenture stock £132,000—there was an aggregate of about £350,000. Standing by itself, this was not a very large sum for a Company of the size of theirs; but very much of it was already appropriated to the development and extension of the works. They owed a good deal of money. Already they had issued £50,000 of terminable preference stock at 6 p.c.; and when everything that had to be done was completed, it would leave them with very little in hand. But he was sure the proprietors would feel that, in these difficult conditions, when they wanted to agree with all their prospective adversaries as far as they could, and to be as reasonable as possible, it was much better to do as the Board had done, rather than to bring forward exaggerated proposals which would lay them open to attack.

As to the standard price of gas, it had been suggested that this matter had better have been left alone by the Company, and that it should have been relegated to the Government to deal with on their own initiative when and how they thought fit. At the last general meeting of the Company, they might remember, he ventured to differ from this view. Other companies had also differed, and had gone forward seeking redress in this matter of powers of charge and the contingent dividend. It would be obviously absurd to take powers to raise further capital under an old standard price, which was 100 p.ct. at least, and probably nearly 200 p.ct., behind what it ought to be to-day on the same grounds as those on which it was established. The Bill proposed to raise the standard price by 50 p.ct.—from 3s. 2d. to 4s. 9d. per 1000 c.ft. The standard price was the price at which Parliament thought the Company could sell gas without being open to criticism or deserving of praise. In view of the increased costs, in a strictly logical ratio they should have asked for 150 p.ct. increase; and 50 p.ct. was the very least they could go for. The same thing applied to prepayment meters. The price of a prepayment installation had risen from something like £7 before the war to over £18 to-day; but the Company asked for only 50 p.ct. increase in the differential cost. They could not ask for less.

Clause 26 dealt with Directors' fees. This was one of the few companies in which the Directors had to pay their own income-tax. This would be altered; and the clause proposed to disconnect the remuneration of the Directors from the dividend. The effect would be that the Directors would receive within a pound or two of what they did before the war.

The last part of the Bill was devoted to profit-sharing or co-partnership. This proposition had in happier days somewhat of an abstract character; but in the circumstances in which they found themselves to-day, it had passed from a question of abstract interest to urgent and immediate importance. An effort must be made to try and bring out of all the rack and ruin something permanently good in their relations with labour. It was no use leaving it to others to do. They must go forward on their own account. They were not without precedents; and co-partnership, as elaborated and developed by those who had devoted themselves to it, gave them hope of the good understanding with labour in future which now seemed so distant.

Mr. A. Saxby Hands, who has recently been demobilized from the army, has been appointed Midland and South Wales representative of Messrs. George Hands & Co., of London, Birmingham, and Glasgow.

The employees of Mr. George Wilson, gas-meter manufacturer, of Coventry, have been entertained by the firm at a supper and smoking concert, when a bright evening was thoroughly enjoyed by everyone. The Cryolite Athletic Association (the London Staff of the British Aluminium Company, Limited) had a successful fancy-dress dance at the Cannon Street Hotel on the 31st ult.

A "welcome home" dinner given by the Directors of the Reading Gas Company to all their returned employees who served with the forces during the war, was presided over by Mr. T. E. Hewett (the Deputy-Chairman), in the unavoidable absence of the Chairman of the Company (Mr. G. W. Webb, J.P.). Mr. Douglas H. Helps (the Engineer and Manager), replying to the toast of the "Reading Gas Company," pointed out that difficulties had not ceased with the signing of the armistice. The stimulus to win the war having gone, that splendid combination of all classes, without distinction of rank, creed, or faith, which had won the war, seemed to disappear just when they needed it most to face the great problems of reconstruction and production, to improve the position of men, and to make good the waste of the war. Was the war to be the only thing that they had won? Not eventually—he felt certain of that—but how long were the endless disputes at home to go on, which, if continued, would end in a state of chaos! Many people seemed to think that, having won the war, the necessity for doing "the daily round, the common task," had disappeared; while the fact was that it was more necessary than ever. Transitional periods were notoriously times of peril. He felt that there could be no sound and permanent reconstruction of society that did not begin with the individual hearts rather than the heads of men.

BRENTFORD GAS COMPANY.

The Annual Meeting was held last Wednesday, at Caxton Hall, Westminster, S.W.—Mr. R. J. NEVILLE NEVILLE in the chair.

The SECRETARY (Mr. John T. Croxford) read the notice convening the meeting; and the Directors' report and the accounts were taken as read.

UNSTABLE AND MORE ONEROUS CONDITIONS.

The CHAIRMAN, in moving the adoption of the report and accounts, said he did not propose to go very extensively into the details of the accounts. It was almost impossible when the industry was standing as it was to-day to form any sort of comparison with the accounts which they had known. The fact was a revolution had been taking place in regard to the business and the principles on which it had been carried on in the past. They were faced at the present time with great difficulties. Many they could not foresee; many they could foresee. But the Directors were bound to take every sort of precaution they could to bring the affairs of the Company into direct touch with the new conditions. Two of the most important of the changes which had taken place, as every one of the proprietors knew, was the increased cost of raw materials, and the enormous advance in wages. To show what the rise of wages meant, he might point to the fact that the output of gas per pound spent in wages in 1913 was 22,800 c.ft.; it was to day only 12,110 c.ft. This gave the proprietors in concrete form some idea of the great revolution that had been going on, not only in the gas industry, but in every industry in the country. Owing to this fact, the conditions were not stable, and had not been stable during the whole year. There was the increase of wages in February last of 5s. Then they had had a decrease in working hours from 54 to 47 per week, which meant about 13 p.ct. And quite recently, at the end of last year, there was another rise of 5s. in wages. Such fluctuations as these made it impossible for anybody to form any sort of comparison with the previous history of the Company, which, as they all knew, had been a prosperous one over a great number of years. In spite of the difficulties, speaking generally, the business to-day was perfectly sound; and if they could only get stable conditions and decent opportunities and facilities for raising capital, the business would, he thought, be as prosperous as in the past—perhaps not in the immediate future, but when they had got over the changes in conditions, and regulated the Company's operations to them. They were suffering from what was really nothing more than an iniquitous system by which the dividend was regulated on a false basis; and until they could get this basis and the sliding-scale altered in an equitable way, they would have great difficulty in raising capital which, of course, they required at the present time more than at any time before, because they had not had any proper rate of repairs and maintenance for the last five years, and everything was at least 200 p.ct. up in price. Therefore they needed more capital now than they had done for many years; and if they did not get proper commercial terms and conditions upon which they could raise capital, they would have great difficulty. A Bill would shortly come before Parliament for reconstituting the sliding-scale.

TO RECOVER THE POSITION.

During the war the gas companies had done a great deal for the State; and to them the State owed much, both with respect to the help given in the matter of munitions, and the patriotism with which they complied with every regulation which was proposed. The gas companies thought they were entitled to have the sliding-scale revised on such terms as would enable them to raise capital as they wanted it. This would be an important matter for the Company. If the gas industry was successful in this, gas companies would have a fair chance to meet the enormous claims of the community for gas. There was a steady growth in the consumption of gas in the Company's area of supply. There was an increase in the past year, and an increase in the number of consumers. But they had not touched the record they had in 1917, because in that year the Company had in their district a very large number of munitions factories, which used gas for power and heating purposes for meeting the requirements of the war. In spite of all this, in spite of these factories having been shut-down as they were directly after the armistice, the Company were recovering their position, and were only a short way from the position of 1917, which showed that the automatic increase they had relied upon over a number of years was now again having effect. This was not due to the sudden spurts they had during munition years; but it was due to the gradual and expected growth in the consumption of the district, which was in itself a promising feature for the future of the Company.

UNDER CONTROL.

It was not necessary for him to go into the figures in the accounts to any extent, because every figure showed a considerable increase on the previous year. The few items in which increases were not shown were perfectly negligible. The only matters the Company had any real power over were very small—the small items in the accounts. The big items were really controlled against them—such as coal, transport, and wages. They had to do as other people said they should do. They had to take coal such as they could get; transport such as was offered to them; and pay the wages that were imposed upon them. Therefore they were not free agents with regard to these three great points.

TRANSPORT AND COAL HANDLING.

There had been extraordinary difficulty with regard to transport. When they got used to railway traffic, they were switched-off on to sea traffic; and freights had been in a most chaotic state—sometimes rising against them; sometimes dropping a little. Thus they were in great difficulty in regard to their supplies of coal. The Company had done their best to meet this. The proprietors would be glad to hear that last year the Directors acquired a steamer, which had done exceedingly well for the Company; and when they got a whole year's usage of it, they would derive a great deal more benefit from it than during the year under consideration. If they could get another steamer, they would be very glad indeed. However, they were also considering coal-handling facilities—every sort of arrangement they could get for economical handling; and anyone now going over their works would be surprised to see the enormous increase of plant building and general lay-out at Southall and Brentford. There were very large changes at the works which were now going on and coming forward, and which it was hoped would be carried out successfully in the course of the present or next year. The industry had been revolutionized; and they had to do all they could to meet this in the best possible way. The output of gas was sound; but the difficulty was that the profit per unit of output was nothing like it used to be. This was explained by the fact he had mentioned as to increases in the costs of raw material and wages. As to the latter, they amounted in 1913 to £153,000; and last year to £353,000—that was £200,000 more in the five years. This gave some idea as to the difficulties the Directors had to meet in carrying-on the industry on the normal lines to which they had been accustomed.

ADDITIONAL LAND AND WHARVES.

The Board had also been looking ahead at Brentford, where, as the proprietors were aware, the Company suffered great congestion in their works. They had only a small area which was allowed to be used for purposes of gas manufacture. The Board had therefore taken all opportunities to increase the Company's holding of land in the neighbourhood, so that they could get off their gas lands as much as possible those portions of the operations which were not devoted to the making of gas. They had now got an excellent coal wharf at the bend of the Grand Junction Canal, leading to the Brentford Dock. It was now equipped with most excellent cranes; and the proprietors should see the splendid stock of coal the Company had there to meet the contingencies they had to face. They had also now near by a new wharf, called Montgomery's Wharf. They had also dock facilities which would enable them to deal with coke and other materials; and from it they hoped to derive considerable profit. They had in all 20 acres more land than they had this time last year; and this explained the figure they saw in the capital account for new lands and buildings. The Company would therefore be better equipped than ever before both at Brentford and Southall; and they hoped they would get the new business which was waiting for them.

MORE CAPITAL PER UNIT OF BUSINESS.

But they would require much more capital in the future. For coal stocks they required more capital than before. The cost of building and plant had gone up enormously; as also the cost of prepayment installations. It used to cost about £6 for an automatic meter installation. It now cost them £25. Therefore the profit they expected from automatic meters had been largely cut-down by reason of the effect of initial cost. Parliament recognized in the Company's Bill last year that they required more capital; and therefore granted them double the capital they had before 1919. Parliament recognized that everything the Company needed cost at least double what it did before; and therefore the capital had been increased in the way seen in Account "A." The main thing was the sliding-scale. The Directors hoped this would be put into a proper "state of repair." Then they would have a chance of raising capital.

A SIXPENNY "ALLOWANCE."

With regard to the domestic consumers and the rebate of 10s. per ton of coal, this had been worked out very carefully. It must be remembered the Company were not entirely coal gas producers; and fortunately for the Company they were to some extent—indeed to a considerable extent—able to use water gas. He had no doubt they would find a great use for it in the future, because it enabled them to deal with some of their bye-products in an economical way. The amount of rebate they would be able to allow to the domestic consumers came in their case to 6d. per 1000 c.ft. This was at the rate of £120,000 per annum for the consumers. When they remembered that the total dividend was £57,000—that was what they were paying this year—he did not think they were unduly hard on their consumers who had more than double the amount the stockholders obtained. For the first time the price of gas had been raised above the standard price of 3s. 9d. Their price was now 4s. 10d.; and they had been enabled to make use of the Statutory Undertakings (Temporary Increase of Charges) Act. This empowered them to pay a larger dividend than that to which they would be entitled under the sliding-scale. When, however, they worked-out the dividend which the Act entitled them to pay, they found the relief afforded was £8500 per annum and this amounted to 6s. 8d. p.ct. on the capital (which was about 2½ millions), and meant about ½d. per 1000 c.ft., or less than half the amount a beneficent Government deducted from the dividends in the shape of income-tax. They were thankful for small mercies; but when they came to look at their gift in the mouth, they found it had a large mouth—in fact, it seemed to be all mouth. [Laughter.]

Sir ROBERT SHAFTO ADAIR, Bart., seconded the motion.

PROPAGANDA FOR SECURING JUSTICE—PROPRIETORS' HELP WANTED.

Sir JOHN LITHIBY said, before the report was passed, he thought the proprietors ought to express their opinion as to the way in which propaganda work was being conducted by the Directors. They all knew that in the past the Company had been a most successful one; and he thought one must be very grateful to the Directors for the excellent way in which they had done their work. But the time had come when they ought to change their attitude as stockholders, and ask the Directors to give them in the report a great deal more information than they were in the habit of doing. Such a statement as they had in the present report was excellent when they were doing well; it was not sufficient when they were doing badly. The dividends to be declared that day were a disgrace—not to the Directors, but to the Company and the country. The Directors were not allowed to give the proprietors what they would give them if they were able to conduct the business in a proper manner. But at every step they were met by the Government with opposition. He thought this ought to be told to the stockholders in the report, so that they would be brought to the annual meeting not in a score but in their two and three hundreds, and take an interest, and assist in some sort of propaganda being put on foot to help the Directors in carrying on the business. The Chairman told them the Board of Trade were going to introduce a

Bill. Who opposed the Bill two years ago that was to give the gas companies what they asked for in the way of financial relief?—the Government, the Board of Trade, and a Committee of the House of Commons. The gas companies did not get what they asked for; and they would not get it again unless there was common co-operation among stockholders to induce the Government to change their attitude. He should like to ask whether any money was being set apart by the Directors for propaganda work, because if they agreed with him that propaganda work was necessary, money would be essential, and he should like to hear that not only their Company but other companies were moving in this way. There was among the Directors the Governor of the Gas Light and Coke Company; and he should like to ask whether that Company could not assist in a movement of this kind. He should like to tell them what was in his mind. Their dividends were low; and the market value of their capital was proportionately low. The value of the capital of the Company was much smaller than it was five years ago. It would go on decreasing if the dividends were further reduced. It was the business of the stockholders to take action to prevent the further depreciation of their capital. In his opinion, they ought to have had some alarmist information put into the report for fighting purposes. He suggested that the stockholders should get together, and endeavour to assist the Directors to meet their difficulties.

The CHAIRMAN said the Directors were quite alive to the necessity for propaganda. The trouble was that the Company had only 1800 proprietors; and nowadays big battalions in politics were extraordinarily important.

Sir JOHN LITHIBY: We can represent the position to our members.

The CHAIRMAN (proceeding) said that what really mattered in these things was influence; and he quite agreed with the proprietor as to propaganda. This the Board had had before them for a long time; and something had been done. The Company were interested in the National Gas Council, of which Mr. Milne Watson was the President. The Council, in this and other matters, had been looking after the interests of the industry as a whole; and had it not been for the care they had exercised, he could assure the proprietors the industry would have been in a worse position to-day than it was. They were the people who negotiated for the industry at large on all the points which were affecting it; and they would use all their effort and all their influence with members of Parliament. But, of course, any personal influence possessed by proprietors would be welcomed. Use should be made of every bit of available propaganda.

Sir JOHN LITHIBY: My suggestion is that you should get the proprietors together to help you.

Mr. MILNE WATSON said he should like to mention what the Chairman had not said. In 1918, when the Government Bill was before the House for the purpose of giving gas companies a limited dividend (which amounted to 3 p.ct. on the 4 p.ct. stock), the Board of this Company circularized all the proprietors, and asked them to bring the matter before their individual members of Parliament. He thought he could say this had a great effect. He entirely agreed with Sir John that the proprietors should do their part. They could, by bringing pressure to bear on those representing them in Parliament, do a great deal to facilitate the passing of an Act for the relief of the Company and the rest of the gas industry. This seemed to him to be the correct thing to do. He hoped the Board would take some steps to rouse the proprietors to try to help in this matter.

The motion was unanimously carried.

THE DIVIDENDS.

Proposed by the CHAIRMAN, and seconded by Sir ROBERT SHAFTO ADAIR, dividends were declared at the rates per annum of 5 p.ct. on the preference stock, 3 p.ct. on the "A" consolidated stock, and £2 12s. 6d. p.ct. on the "B" consolidated stock, less income-tax.

RE-ELECTION OF DIRECTORS AND AUDITORS.

On the motion of Sir ROBERT SHAFTO ADAIR, seconded by Mr. D. MILNE WATSON, the retiring Directors (Mr. R. J. Neville Neville, Brigadier-General A. H. W. Cowie, C.M.G., and Mr. H. E. Griffith) were re-elected; and, on the proposition of Mr. SAMUEL SPENCER, the retiring Auditors (Mr. Monier F. Monier-Williams and Mr. Alfred Bevis) were re-appointed.

A VOTE OF THANKS.

Sir JOHN LITHIBY proposed a vote of thanks to the Chairman and Directors. Adverting to his former remarks, he said he hoped the Directors would bear in mind that this was only one Company, and that there were a great many other companies in the country and a great many corporations who owned gas-works. If they were collectively to do anything effectual, now was the time to get the whole gas industry moving in the matter to which they had been referring.

Mr. H. WELLER seconded the motion, which was heartily passed.

The CHAIRMAN, in the course of his acknowledgment on behalf of himself and his colleagues, said he hoped all the proprietors would take to heart what Sir John Lithiby had said, and would help by their influence in the way gas companies were heading at the present time. The whole industry practically—company and municipal undertakings—was now being represented by the National Gas Council. Never before had the industry been roped together in this way. Mr. Milne Watson and other members of the Board had taken an active part in the starting of the Council; and they had a Central Executive Board which spoke for the whole industry.

Gas-Works Results at Darlington.—Speaking in the Darlington Town Council, Mr. A. J. Best said that in the last financial year there was a profit on the gas-works of £7249, after income-tax and other charges had been met. All this profit came from the domestic consumers, because the large consumers were not paying the full cost of production. During 24 years, the average paid over to the rates was 6½d. in the pound, towards which the industrial consumers had not contributed, though they had the benefit of the relief of the rates. A definite promise had been made that at the end of the financial year the matter would be gone into.

QUALITY OF GAS.

The British Association Fuel Economy Committee and the Board of Trade.

A deputation from the Fuel Economy Committee of the British Association for the Advancement of Science waited, on Monday last, on the President of the Board of Trade, in order to bring before him certain considerations which, in their view, should receive full weight in legislation regulating the supply of gas. The deputation consisted of Prof. W. A. Bone, D.Sc., F.R.S., Sir Robert Hadfield, Mr. W. H. Patchell, and Mr. H. James Yates.

Prof. Bone called attention to a report on gas standards which had been made to the Board of Trade by the Fuel Research Board; the conclusions of a conference between representatives of consumers, local authorities, and gas undertakings in regard to the Research Board's report; and to a statement made in the House of Commons by Sir Auckland Geddes, that a Bill would be introduced to give effect to the recommendations of the Fuel Research Board. As the British Association Committee had not had an opportunity to present their views to the Research Board, they had asked permission to lay these views before the President They looked at the whole question of gas standards primarily from the point of view of national interests, and generally from that of domestic and industrial consumers. They agreed that the basis of charge to the consumer should be the actual number of thermal units supplied to him in the gas which passed through his meter. They would, however, substitute in the Research Board's recent proposal the words "ascertained net calorific value" of the gas for the words "declared gross calorific value." What really mattered to the consumer was the actual heating effect he received from the gas supplied to him, as ascertained by independent tests. The Research Board, who had originally recommended a pressure of not less than 2 in. of water at the exit of the consumer's meter, had since reduced their proposal to a pressure of not less than 2 in. of water in any main or service pipe of 2 in. diameter. What mattered to the consumer was the adequacy of the pressure in his own pipes, and not the pressure outside in the gas-mains. It was also of great importance that as constant a pressure as possible should be maintained. The Committee were also of opinion that gas undertakings should be compelled to pay great attention to the removal from gas of the highly poisonous cyanogen compounds. The Fuel Research Board had apparently acquiesced in the view that the chemical composition of the different grades of gas was a matter of indifference to the consumer. Scientific research, extending over forty years, had, however, proved that the chemical character and the modes of combustion of the gases which made up coal gas did profoundly affect their uses for power and heating purposes. He pointed out that coal gas consisted chiefly of three gases with widely different properties—hydrogen, methane (a hydrocarbon), and carbonic oxide. Hydrogen and methane were not poisonous; but carbonic oxide was exceedingly poisonous. It was therefore necessary, in the interests of the health of consumers, that the proportion of carbonic oxide in gas as supplied should be limited. He showed, by means of a series of diagrams taken from experiments, that hydrogen and carbonic oxide, when mixed with air in varying proportions, gave a very wide range of explosion. The range of explosion with methane and air was, on the other hand, very short. Methane had the effect of reducing the explosive range of hydrogen and carbonic oxide. In order, therefore, to diminish the risk of back-firing and of accidental explosions due to an escape of gas, the proportion of methane should not be allowed to fall below a certain point. He showed by means of other diagrams—obtained photographically by exploding hydrogen and air, and carbonic oxide and air, in a closed steel bomb—that hydrogen and air exploded with a sharp "kick," while the explosion of carbonic oxide and air was much more gradual. Since a quick explosion was bad for gas-power machinery, the proportion of hydrogen in coal gas used for power must not be too high. The conclusion of the Committee was that the proportion of methane in coal gas should not be less than 20 p.ct., and the permitted proportion of carbonic oxide should not be more than 20 p.ct.

Mr. Yates said that, in the view of the Committee, the minimum number of British thermal units should be not less than 450. If gas undertakings supplied gas of lower heat efficiency, a large part of the existing gas appliances would become useless.

Sir Auckland Geddess, in his reply, said the basis of charge should clearly be the actual calorific value of the gas supplied to consumers. He would consider the views of the Committee in regard to pressure. He had been impressed with the physiological side of the question, and with the danger of cyanogen and of too high a proportion of carbonic oxide. Leaks of gas frequently occurred. He would give full consideration to the opinions and facts which had been submitted to him.

LONDON COUNTY COUNCIL AND GAS AFFAIRS.

Gas-Meter Testing—Temporary Increase of Charges.

In the report of the Public Control Committee of the London County Council prepared for presentation at to-day's meeting of the Council, the following paragraphs appeared:

It has been the Council's practice for many years not to charge a fee, in certain circumstances, for testing gas-meters which have been rejected, and which are submitted for testing by the makers a second time. This procedure, however, has not only resulted in a loss of fees, estimated at £500 a year, but has entailed considerable additional clerical work in identifying rejected meters when re-submitted, and has made the task of auditing more difficult. We have accordingly arranged that, as from Jan. 1, 1920, a fee shall be charged for each test of a meter irrespective of whether it is stamped or not. The City

Corporation and the Middlesex County Council have adopted a similar course of procedure to take effect on the same date.

We have considered applications by Metropolitan Gas Companies to the Board of Trade for Orders under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, modifying the sliding-scale conditions, so as to enable them to pay dividends on ordinary stocks at three-quarters of the respective standard rate of dividends, notwithstanding that the price of gas would not otherwise permit the distribution of dividends at such rates. We made representations to the Board in each case, principally with a view to securing the insertion in the Order of a limitation to the price which the companies may charge for gas during the operation of the Order. In the result, the Board decided to make Orders in the under-mentioned cases, fixing maximum prices as indicated: Gas Light and Coke Company 4s. 8d. per 1000 c.ft.; South Metropolitan Gas Company, 4s. 8d.; South Suburban Gas Company (in London area), 5s. 5d.; Brentford Gas Company, 4s. 10d.

WANDSWORTH GAS COMPANY'S BILL.

The Chairman Explains the Proposals.

In view of the public interest aroused by the Wandsworth, Wimbledon, and Epsom District Gas Company's intention to apply to Parliament for power to erect gasholders on land owned by the Company in Merton Road, and the opposition to the scheme undertaken by a recently formed Protest Committee in Southfields, a representative of the "Wandsworth Borough News" has interviewed Mr. H. E. Jones, the Chairman of the Company, as to the proposals involved in the application to Parliament, and the objections which have been advanced thereto in the locality.

"Money is being collected in the neighbourhood of the site," observed Mr. Jones, in the course of the interview, "on representations which are not grounded on truth as to the Company's intentions and objects." He explained that land in Merton Road was bought very much in excess of what the Company required for re-housing people who were displaced under the Bill of 1902, when the Company cleared away the area now covered by their gas-works in Fairfield Street. The Company had used a portion of this land, and had fulfilled the obligations of that Act of Parliament by housing everybody to the satisfaction of the authorities, who were bound to see they carried out their undertakings. The considerable surplus space remaining, which was very waterlogged, has been improved by raising its surface 3 or 4 ft. The whole of the land in question was lent to the public, through the local authorities, free of rent during the war, for allotments. In addition, the Company have widened Merton Road at that point by throwing a strip of land into the public way.

With regard to anything the Company might do to the land as to storing gas, nothing would be visible except from the houses immediately opposite the Merton Road frontage of the site. In any case, it is not proposed to build very lofty gasholders which would be seen from the road. Although the Company are under no obligation to do so, they will probably accommodate their own working people by building some flats along the street front; and when these are erected the people, even on the opposite side of Merton Road, will be able to see nothing but these flats. There is no intention of undertaking the manufacture of gas on the land. The idea is only to store gas in comparatively low holders. The whole thing is perfectly harmless, and cannot possibly be unsightly to residents in the neighbourhood.

Asked why it had been decided to apply for powers to store gas on this site, Mr. Jones replied: "The Company have recently come under a pledge to the Board of Trade to give a pressure of gas in all parts of their system in a way that will involve from four to five times the weight of obligation previously resting upon us; and unless gas can be stored in the area of consumption, it will mean tremendous delay and endless public inconvenience by the taking-up of roads to lay larger pipes in all directions, which can only be done at war prices, greatly exceeding previous experience, and tending to make the supply of gas more expensive. Great public inconvenience, great loss to the consumers, and avoidable capital expenditure will accrue, unless some gas is stored on this site. I believe that, when the whole scheme is carried out, no one in the neighbourhood will be able to discover any grievance or source of complaint. Indeed, residents will not be able from their houses to see what use is being made of the land."

GAS SUPPLY IN LANARKSHIRE.

At a Meeting of the District Committee of the Middle Ward of Lanarkshire, last Friday week—Mr. Thomas Arnott (the Chairman) presiding—a report was submitted by a Sub-Committee on the subject of gas supply. The Clerk (Mr. W. E. Whyte) gave a full explanation as to the powers of the District Committee in the matter of gas supply within their area, and of the various steps which had been taken by the District Committee, both by way of obtaining expert advice on the subject, and by the adoption of the Burghs Gas Supply (Scotland) Act, 1876, to certain areas in the Middle Ward District. He further reported that, in terms of the remit given at the last meeting, Mr. W. Doig Gibb (Consulting Gas Engineer) and himself had had informal conversations with representatives of certain of the gas companies; and he indicated the progress which had been made in this connection. After full discussion, the meeting unanimously adopted a suggestion by the Clerk that an early meeting should take place, at which Mr. Doig Gibb should be present, in order that the Committee might have an opportunity of obtaining further technical information, and particulars connected with the project, preparatory to taking definite steps in certain directions. The Clerk was empowered to obtain whatever expert financial advice he might think necessary; so that the Committee might be fortified with the fullest possible guidance. The District Committee approved.

PRESENTATION TO MR. J. W. BROADHEAD.

The recent marriage of Mr. J. W. Broadhead, Managing-Director of Messrs. Robert Dempster & Sons, Ltd. [which was recorded in the "JOURNAL" for the 13th ult.], has been marked by a handsome presentation by the employees. Last Saturday week, about 500 of the employees, on the invitation of the Board of Directors sat down to tea at the works; and this was followed by a concert, presided over by Mr. W. F. Perkins, M.P., during which Mr. C. T. Jacobs (Secretary of the Company) presented Mr. Broadhead with a suitably inscribed mahogany canteen of silver cutlery and two cases of pipes. Mr. Broadhead, in returning thanks for the handsome gift, said its value was considerably enhanced by the knowledge that it had been subscribed for by the whole of the workers of the firm. He remarked that when he came to Elland first as an apprentice, and left in 1884, he little thought he should return in 1892 as Manager, and become in due time Managing-Director of this important engineering concern. He looked back with pride and satisfaction at what had been achieved during this period of 27½ years; but the success achieved could not have been attained had he not been ably supported by every employee. Really he considered himself lucky to have found Mr. Jacobs waiting for him in Elland. To-day the firm were in a position to put on the market the very finest carbonizing plants in this country or any other, for gas-works purposes—particularly with regard to continuous vertical retorts. While speaking of vertical retorts, he must mention the name of Mr. Toogood, the patentee, whose ingenuity and perseverance had enabled the firm to bring their verticals to the present perfect state. They had also made a big speciality of labour-saving handling plants of every description; and to-day they were the largest firm in the kingdom making telphers for dealing with coal and coke, &c.

NOTTINGHAM GAS AFFAIRS.

A resolution moved by Mr. W. Wesson, an ex-President of the Trades Council, was discussed at considerable length at the last meeting of the Nottingham City Council. It embodied an instruction to the Gas Committee to organize the work of the department so that continuous employment may be found for the whole of the staff. He explained that the desire of the labour representatives was that this consideration should apply to all sections of Corporation work; but the Gas Department was mentioned in particular, because men in this branch of municipal work were specially affected. Owing to the continued suspension of street lighting last year, there had been a large measure of unemployment. The resolution was seconded by the ex-Mayor (Alderman J. E. Pendleton), who was himself formerly actively identified with the trade union movement in Nottingham; but Mr. H. Gover Ford (the Vice-Chairman of the Gas Committee), in opposing the proposal, contended that, if it were passed, it would reduce the Gas Department to a state of chaos. He moved, as an amendment, that the words "as far as practicable" should be inserted in the resolution; and this having been seconded by Alderman Bernard Wright, Mr. H. Bowles declared upon behalf of the labour representatives their inability to accept it.

Mr. Ford's amendment was carried; and the resolution as thus altered was referred to the consideration of a Committee of Chairmen and Vice-Chairmen of the Council. At another stage of the meeting the question of the indifferent lighting of Nottingham streets was again brought under notice; Mr. J. Clarkson moving that the Gas Committee should be instructed to light another 25 p.ct. of the total number of lamps, making 75 p.ct. in all. It was pointed out in support of the proposal that numerous accidents had occurred through the present inadequate illumination of the streets; but Mr. Ford said it all came back to the question of coal supply. The Committee had only three or four days' supply of coal in hand. By 18 votes to 16, however, Mr. Clarkson's proposal was adopted.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Feb.* 9.

During the past week tar products generally have been in strong demand, and prices are firm all round. Makers' idea of price for pitch is over 110s. per ton net f.o.b. makers' works. Creosote is firm at not below 9d. per gallon net in bulk. Pure benzol and pure toluol are about 3s. per gallon. Solvent naphtha is about 3s. 6d. per gallon. Naphthalenes are advancing. Anthracene, 48 to 50 p.ct., is 9d. per unit, casks included.

The price to farmers for sulphate of ammonia for the current month is £21 15s. per ton, basis 24½ p.ct., and a discount of 10s. per ton to dealers.

Tar Products in the Provinces.

Feb. 9.

The average values for gas-works products during the week were: Gas-works coal tar, 61s. to 66s. Pitch, East Coast, 105s. to 107s. 6d. per ton f.a.s.; West Coast—Manchester, 95s. to 100s.; Liverpool, 95s. to 100s.; Clyde, 105s. to 107s. 6d. nominal. Benzol 90 p.ct., North, 2s. 3d. to 2s. 4d.; crude 65 p.ct. at 120° C., 1s. 5d. to 1s. 7d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 2d. to 2s. 4d. Toluol, naked, North, 2s. 5d. to 2s. 6d. nominal. Coal tar crude naphtha in bulk, North, 10d. to 10½d. Solvent naphtha, naked, North, 3s. 1d. to 3s. 3d. Heavy naphtha, North, 3s. 2d. to 3s. 3d. Creosote, in bulk, North, liquid, 8d. to 8½d.; salty, 7d. to 7½d. Heavy oils, in bulk, North, 8½d. to 9d. Carbolic acid, 60 p.ct., 3s. 3d. to 3s. 6d. Naphthalene, £18 to £22; salts, £6 10s. to £7 10s., bags included. Anthracene, "A" quality, 7½d. to 8d. per minimum 40 p.ct.; "B" quality, nominal.

FROM A MARKET CORRESPONDENT.

Tar Products.

A very strong tone continues, and although there is a pretty general upward tendency in prices, quotations are difficult to fix, particularly in the case of pitch. All sorts of values are reported, among which are London 110s. f.o.b. and 102s. 6d. Manchester. South Wales is 107s. 6d. In many quarters, however, these varying prices are merely reflections of the fall in the value of the pound. Creosote is a very firm market; and there is no saying to what level prices may advance. Cresylic acid is rather dearer; but carbolic is not much changed. Naphthalenes are rather quiet, although refined is not too plentiful. Crudes, however, are cheaper; this being the period of greatest production. Naphthas are firmer, particularly the solvent, for which 3s. 6d. per gallon is quoted; but it is probable that small quantities could be had for a trifle under this price. Intermediate products are in demand; but no spot supplies are available. Owing to general uncertainty, manufacturers do not care to make forward sales. Aniline oil and salts are unchanged; but salicylic acid is dearer at 3s. 6d. to 3s. 9d. per pound.

Latest quotations are as follows:

Benzol: 90% London 2s. to 2s. 2d., North 1s. 11d. to 2s.; 50-90% 1s. 9d. to 2s. London, 1s. 10½d. North; crude, 60-65% 1s. 5d. to 1s. 7d.; pure, 3s. per gallon naked.

Crude Tar: London, 60s. to 65s.; Midlands, 53s. to 60s.; North, 57s. to 60s. per ton *ex* works. Refined tar, 34s. 6d. per barrel (free) on rail.

Pitch: London, 110s. per ton; East Coast, 102s. 6d. to 107s. 6d. per ton; West Coast, 100s. to 110s., with Manchester 102s. 6d. per ton, and Glasgow 105s. per ton; South Wales, 107s. 6d. per ton.

Solvent Naphtha: London, 3s. 6d. Provinces average 3s. 4d. per gallon.

Crude Naphtha: Naked, 10d.; North, 9d. per gallon.

Heavy Naphtha: 2s. 10d. per gallon.

Naphthalene: Refined, £23 per ton nominal; crude, £7 to £10 10s., according to quality.

Toluol: Naked, 2s. 9d. per gallon nominal. North, 2s. 7d. Pure, 3s.

Creosote: London, 8¼d.; North, 7¾d. to 8d.; heavy oil, 7¼d. per gallon in bulk.

Anthracene: 40-45%, 9d. per unit per cwt.

Grease Oils: 18° Tw. (naked), £6 10s. per ton f.o.r. makers' works.

Aniline Oil: 1s. 7d. to 1s. 8d. per lb., drums free.

Cresylic Acid: 95%, 3s. to 3s. 3d.; 97-99%, 3s. 3d. to 3s. 6d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 3s. 3d. per gallon; crystals 40%, 1s. to 1s. 2d. per lb.

Sulphate of Ammonia.

Inquiry continues good, and an average business is being done. Production is increasing, particularly in South Wales, where new ovens are being started frequently. Some 500 more ovens, it is estimated, will be ready for action before the end of the current half year. There is no fresh news from across the Atlantic, and there are no grounds for anticipating exports from that side. This view is emphasized by the fact that the exchange situation is such as to hinder most countries from importing American goods to any advantage.

Poor Coal at Dewsbury.—The Dewsbury Corporation General Purposes Committee have called the attention of the Prime Minister and the Coal Controller to the small quantity and poor quality of the coal supplied to the municipal gas-works, with an urgent request for a better supply. They ask that this should come from pits in the neighbourhood of the town. The town was almost without gas on the night of Feb. 5. In spite of adverse conditions in gas supply, the Council approved an advance in the salary of Mr. G. W. Fligg, the Gas Manager, from £350 to £450 per annum—recognizing that neither he nor the Committee was responsible for the poor supply.

Report of the Scarborough Gas Company.—Reporting to the shareholders on the accounts for the year ended Dec. 31, the Directors, after providing for interest charges and the dividends on the preference stock, recommend the payment of the usual dividends on the ordinary stock, at the rate of 5 p.ct. per annum. This will leave a balance on the profit and loss account of £2891 to carry forward. The sum of £6500 has been placed to the credit of reserve account; this being about one-half the amount withdrawn during the war. The sale of gas for the year shows the large increase of 74 million c.ft. (24 p.ct.) over the previous twelvemonth. The costs of materials and labour have continued to increase. By agreement or arbitration between the Federation of Gas Employers and the National Federation of General Workers, wages have been increased on two occasions and working hours reduced to 47 per week. During the year £35,750 of 6 p.ct. mortgages, for a period of five years, have been issued for the purpose of paying-off a similar amount of 5 p.ct. loans.

Newport (Mon.) Gas Company.—Presiding at the half-yearly meeting, Mr. George Geen said that in the six months ended Dec. 31 the sales of gas were the highest recorded in the history of the Company—namely, 271 million c.ft., which was an increase of some 18¾ p.ct. over the corresponding period of the previous year. This fact mainly accounted for an increase of £12,233 in the receipts. An Order had been secured under the Temporary Increase of Charges Act; and the Directors recommended a dividend for the half year at the rate of 3¾ p.ct. per annum, though to pay this £1400 would need to be taken from the reserve fund. For over sixty years past, the Company had never had a similar experience, but had always paid, in good times and bad, the moderate dividend of 5 p.ct. per annum. The office staff, under Mr. T. H. Hazell, had carried out their work admirably; and from the manufacturing point of view the Company owed a deep debt of gratitude to Mr. J. H. Canning (the Engineer), for the great efforts he had put forward in coping with a difficult situation.

USE Simmance's

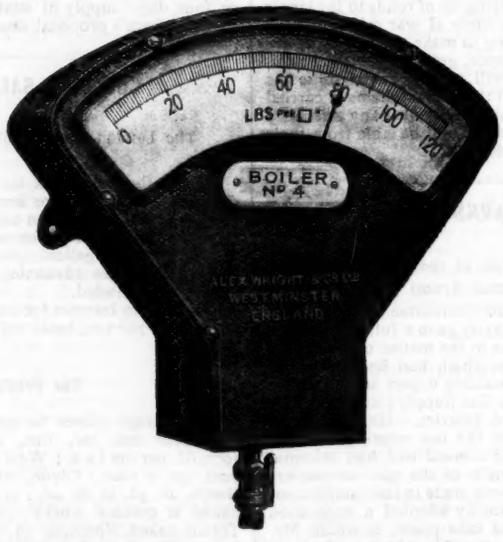
DEAD BEAT INDICATORS

instead of WATER-TUBE GAUGES and

"READ THE PRESSURE BY THE POINTER."

No liquid to evaporate and no levels to adjust.

No glasses to break and nothing to clean.



Direct reading, Open scale, Any range (Pressure, Vacuum, or Combination).

Incorrodible, Accurate, for foul or purified gas.

MADE IN MANY RANGES WITH TABLETS LETTERED AS DESIRED.

ALEXANDER WRIGHT & CO., LTD., WESTMINSTER.

Agents: Australia—FYVIE & STEWART, 360, Collins St., Melbourne: Canada—W. P. ROPER, 502, Merchants' Bank Building, Montreal.

South Metropolitan Gas Bill.—The following resolution was passed at a conference of South London boroughs on the South Metropolitan Gas Bill: "That the Councils of the South Metropolitan boroughs be recommended that, in the opinion of this conference, it is expedient to join with the Camberwell Borough Council in opposition to the South Metropolitan Gas Bill, 1920, in order to obtain amendments and clauses for the protection of their interests; that one representative from each Council be appointed to serve on a Special Committee for this purpose; and that the cost of such opposition be shared in proportion to rateable value."

Maximum Increase beyond the Statutory Maximum Charge.—The Town Clerk has reported to the Chelmsford Corporation that he had been in communication with the Ministry of Health, with a view to ascertaining whether the Ministry would be prepared to grant an Order under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, to provide for another modification of the provisions of section 20 of the Chelmsford Corporation Gas Act, 1915, so as to authorize the Corporation to further increase the price of gas supplied by them. He read a letter, dated Dec. 19, from the Ministry of Health, stating that the Ministry were advised that they could not authorize under the Act any increase of charges which was more than 50 p.ct. in excess of the statutory maximum charge.

British Sulphate of Ammonia Federation.—At the Ulverston Urban District Council meeting last Tuesday there was some discussion over a recommendation by the Gas and Water Committee that the Council should enter into an agreement with the British Sulphate of Ammonia Federation. Mr. A. E. Sadler, J.P. (the Chairman of the Committee), recommended the Council to join the Federation. Mr. Court however opposed, on the ground that monopolies were not good for commerce. Mr. Sadler remarked that trusts had come to stay; and if 98 p.ct. of the manufacturers of sulphate of ammonia were inside the Federation, it was not much use those who produced only 2 p.ct. standing outside. It was decided that the Council should join, subject to the agreement being satisfactory to Mr. Sadler, whose firm is in membership.

Suggested Gas Consumers' Association.—Mr. David Flather, the President of the Sheffield Gas Consumers' Association, has addressed a letter to the Press, in which he says that, now the national needs of the war period are largely removed, consumers ought to see that the suppliers of gas are not permitted to continue the "war quality" as a permanent supply. He states that his object in writing the letter is "to impress upon consumers the importance of their combining together in each district so as to exercise a wholesome control over the activities of the gas undertakings upon which they depend for their supplies. The Association over which I have the honour to preside is, so far as I am aware, the only one in this country; and our experiences, and the results of our work, are such as to warrant our urging the formation of similar organizations in every district dependent on gas, either for domestic or industrial use."

Grantham Gas Company.—The financial statement presented at the 91st half-yearly meeting of the Company, held last Tuesday, under the presidency of Mr. J. G. Thompson, showed a balance of £1455 upon the profit and loss account, out of which the Directors recommended the payment of a dividend at the rate of 5 p.ct. per annum on the consolidated stock, carrying forward the balance to the next account. There had been a further increase of wages during the half year, and an increase in the price of coal; the balance on profit and loss account leaving a very small margin for the future. Having regard to the reduction of 10s. a ton in the price of domestic coal, the Directors proposed to reduce the price charged for gas for household and domestic consumption by 8d. per 1000 c.ft. The report was adopted.

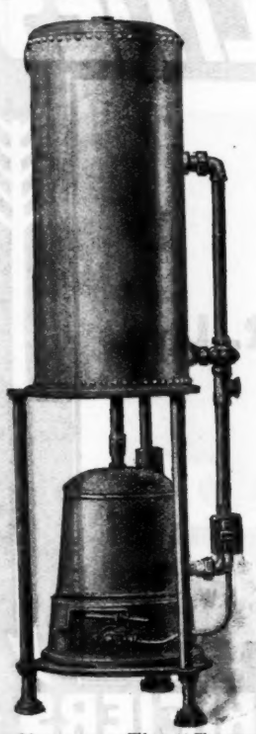
Tottenham District Light, Heat, and Power Company.—At the annual meeting next Friday, the Directors will report that the accounts show, after payment of a dividend at the full statutory rate for the half year ended June 30, and providing for interest and all other standing charges, an available profit of £16,155. Further wages awards (including the shortening of hours of labour), together with the July, 1919, increase in the cost of coal, put the Company within the scope of the Statutory Undertakings (Temporary Increase of Charges) Act. The Directors therefore applied for, and obtained, an Order from the Board of Trade under the Act. In pursuance thereof, the Company may, in respect of the half year ended Dec. 31 last, and so long as the price of gas does not exceed 4s. 8d. per 1000 c ft., with the consent of the Board of Trade, pay dividends at the rate of 3¾ p.ct. per annum on the "A" stock, and 2⅝ p.ct. per annum on the "B" stock. The Directors accordingly recommend the payment of such dividends, together with a dividend at the rate of 5 p.ct. per annum on the preference stock, all less income-tax.

Stockton and the Coal Control Department.—It was reported at a meeting of the Stockton-on-Tees Town Council last Tuesday that the Gas Committee had intended to reduce the price of gas to domestic consumers 4d. per 1000 c.ft., to allow an additional 5 p.ct. discount to the users of slot-meters, and to reduce the price of coke for domestic purposes by 3d. per cwt. A new Coal Order had, however, been issued; and these resolutions had had to be rescinded, as the Order laid it down that the amount of any reduction could only be calculated upon the coal actually consumed for domestic gas manufacture, and that any advantage which could be given through the 10s. reduction in the price of coal should take the form of a rebate. While accepting the Order, the Gas Committee had warmly protested against it, inasmuch as it would be most cumbersome to work and expensive to carry out. The Mayor (Mr. J. M'Naughton) said it was going to need a skilled staff to work out the calculations; and Mr. Warters remarked that he was horrified at the amount of labour it would entail in the Accountant's Department. Alderman Natrass said that whatever good the Coal Controller had been doing during the year, if this was his way of doing things, he was outstaying his welcome. The Gas Committee's protest was, in his opinion, too mild.

We are exhibiting at the Ideal Home Exhibition, Olympia, Feb. 4th to 25th. Stand No. 15.

The "Main"

We are exhibiting at the British Industries Fair, Birmingham, Feb. 23rd to Mar. 5th. Stands Nos. 74|75.



No. 424. The "Energy."
Stands can be supplied to any desired height.

Circulating Water Heater.

THIS Gas Heater is constructed throughout of strong cast iron with corrugated inner and outer jackets giving an unprecedented heating surface. The gases, after heating the inner jacket, are drawn to the base, and to reach the flue outlet must travel over the outer casing, thus utilising the heat to the utmost.

A really efficient thermostat is fitted; and the heat-retaining outside casing is made of steel, porcelain enamelled, giving the heater a most attractive appearance.

A sample will convince you of its efficiency.

R. & A. MAIN, LTD.

WORKS: Gothic Works, EDMONTON, N.18; Gothic Ironworks, FALKIRK and Gothic Works, BIRMINGHAM.

SHOW-ROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.1; 82, Gordon Street, GLASGOW; 18, Severn Street, Deansgate, MANCHESTER; 97, Millfield, BELFAST; 6, Narrow Wine Street, BRISTOL; 333, Queen Street, MELBOURNE.

Midland Gas Undertakings and Coal Supplies.

The serious position, owing to the shortage of coal supplies, of gas undertakings in the Midlands was drawn attention to by the "Birmingham Daily Post" on Saturday. The writer says: "The Controller, by delegating his work largely to the District Coal Supply Committees, has departed from the policy previously followed by his Department; and instead of the co-ordinated system that formerly prevailed, each District Committee has had thrown back upon it responsibility for its own supplies. Now it is only natural that these Committees, having the interests of their own areas to watch, fail to take the synoptic view which sees the situation as a whole. They are unwilling to denude their supplies to satisfy the needs of more needy areas; and hence there are disparities in different districts. This difficulty, it is argued, is bound to continue until the Co-ordinating Committee in London enunciates a uniform policy for the guidance of the local supply administrators. Until then, the reprehensible spectacle of one area working against another will remain. The present policy of making one hole to fill another is a purblind one." As a result of a meeting at the offices of the Coal Controller in London, steps have been taken to relieve the present shortage.

Silsden Gas-Works Extensions.—The Silsden District Council last week approved a recommendation of the Gas Committee, that application be made for sanction to borrow £5000 for extensions and reconstruction at the gas-works. It was also agreed that the Manager and Chairman of the Committee should visit the carburetted water-gas plant at Budleigh Salterton. The installation of a water-gas plant, it was explained, would increase the town's supply by 50 p.ct.

Falling Off in the Mond Gas Company's Output.—In their report to the shareholders for the year ended Dec. 31, the Directors of the South Staffordshire Mond Gas (Power and Heating) Company state that fuel supplies during the year have been short in quantity and of inferior quality. The whole of the producer fuel stock was used up at the end of November. Since then the Company have had to take slack from stock to make up the difference between deliveries and consumption at the producers, and have now used up nearly all the available stock. They are in constant communication with the Coal Controller and the Board of Trade Committee with reference to fuel supplies. Owing to the labour unrest and strikes during the year (particularly the moulders' strike), the demand for gas fell off considerably; and less fuel was gasified, and 18 p.ct. less gas sold than in 1918. The cost of fuel and all other materials and wages considerably increased. The gross profit for the year was £15,857 compared with £18,232 for 1918. As the amount required for interest is £8482, the net profit for the year is £7375. This, added to the £10,979 brought forward, makes the total standing to the credit of the profit and loss account £18,354. It is proposed to pay the preference dividend for 1918, and carry £13,404 forward.

Disposal of Coke in Leeds.

At the Leeds City Council meeting last week, the Gas Committee reported having refused an offer of 75s. per ton for coke for export. They had done this because of the shortage locally and the effect on industry. The Chairman (Alderman Penrose Green) said if they had accepted they could have saved £100,000, or 9d. per 1000 c.ft. in the price of gas; but they would have left the city and its industry short of coke. Mr. Clark said the sale of half the production of coke would have effected this saving; but the Committee chose to stand patriotically by the needs of the city. In answer to an inquiry as to who was getting the benefit of the coke at its present low local price as against this large figure of possible saving, Alderman Ratcliffe said the selling price in Leeds was controlled; but there was no control on the export price. Alderman Wilson questioned the wisdom of the Committee's action, and thought the large number of gas users would have reason to complain of the price of gas being kept up for the sake of the comparatively few coke users. Mr. Briggs said the offer had been merely temporary owing to the work chaos. Sending the coke away would have meant stopped industry and thousands of unemployed. Mr. J. S. Hinchliffe said industries were now using more and more gas instead of coke; and he suggested that they should take advantage of the offer. They could spare a fairly large quantity of coke in the summer. The sale would give a great impetus to the gas undertaking. At present there was considerable waste of coke, and stocks accumulated in the summer were of comparatively little use in winter. It was eventually agreed that the Committee should reconsider the matter.

Doncaster Gas Undertaking.—The Doncaster Town Council have decided to give a rebate of 9d. per 1000 c.ft. to consumers, as the outcome of the reduction of 10s. per ton in the price of coal. An award has been made by the Industrial Court of an increase of 5s. a week to general gas workers; and the men who were now working 47 hours instead of 54. This will entail a loss of £2280; and, in addition, the 5s. increase will cost approximately £2300. The Gas Committee, it is stated, will be in a serious financial position; and the Council and public are warned that they might be forced in the near future to increase the price of gas in the borough.

Decreased Sale at Pudsey.—The Pudsey Gas Company's annual report, just issued, shows a decrease of 24·54 p.ct. in sales—a decrease in consumption which was anticipated when the munition works closed down and by reason of the fuel and lighting restrictions. The advanced cost of coal and labour has compelled an increase in the price of gas to 4s. per 1000 c.ft. as from August last. The Company have lately secured an Order of the Board of Trade, dated Dec. 29, 1919, to pay dividends on the new consolidated 7 p.ct. stock at three-quarters of the standard rate. The report includes a recommendation of payment of a dividend on the lines of the new Order.

"BEARSCOT" SPECIALITIES
R. & J. DEMPSTER, LTD.,
MANCHESTER.
London Office
CONNAUGHT MANSIONS, 34, VICTORIA STREET, S.W. 1.
London Office Telephone No. Vic. 7426.
FIT YOUR NEW PLANT WITH
AS APPLIED TO
GAS HOLDERS · PURIFIERS ·
CONDENSERS · WECKS VALVES ·
WASHER SCRUBBERS · & &c.

GASHOLDERS

MILBOURNE PATENT ROLLER CARRIAGES. AUTOMATIC LUBRICATION

PURIFIERS

WITH

MILBOURNE PATENT DUPLEX VALVES, AUTOMATIC COVER FASTENERS, SAFETY DISCHARGE SHOOTS, RUBBER JOINTING. "MILBEL" PATENT PURIFIER GRIDS.

CONDENSERS, SCRUBBERS, AND GAS WORKS PLANT OF EVERY DESCRIPTION.

C. & W. WALKER, LTD., DONNINGTON, NEWPORT—SALOP.

LONDON OFFICE: 110, CANNON STREET, E.C.

USEFUL GAS-HEATED APPARATUS THAT SIMPLIFIES DOMESTIC LABOUR.

WRIGHT'S "Novo" Wash-House BOILER

is strongly constructed, fully meeting the need for a Boiler giving durability and good service at a moderate price. It is particularly suited for use in Housing Schemes and in Homes wherever space is limited and saving of time and labour is desired. The Boiler is made with a cast-iron outer case and a cast-iron pan bower-barffed as a protection against rust. It is raised on legs to a convenient working height and has a removable wooden lid giving free access to the Boiler all round.

Capacity - - - - - - 10 gallons.

JOHN WRIGHT & CO.,
Essex Works, Aston,
BIRMINGHAM.

WATER GAS PLANT.

ECONOMICAL GAS APPARATUS CONSTRUCTION COMPANY, LIMITED,

36, Victoria Street, London, S.W.

All the essential Qualities

of a good MANTLE are embodied in the **Volker**

The ALL BRITISH production of an ALL BRITISH Company

The VOLKER LIGHTING CORPORATION, Ld.
Garratt Lane, ——— LONDON, S.W. 18.

COAL TAR AND AMMONIA PRODUCTS.

Benzole, Toluole, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Dark Cresylic Acid, Granulated (Crude) and Sublimed Naphthalene, Anthracene, Refined Tar and Pitch. Sulphate of Ammonia containing a Guaranteed Minimum of 25¼ per cent. Ammonia. Alpha Naphthol, Beta Naphthol, Alpha Naphthylamine, Beta Naphthylamine, Naphthionic Acid, N. and W. Acid.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**
709, Old Kent Road, LONDON, S.E. 15.

Telegraphic Address:
Inland: "Metrogas, Peck. London."
Foreign: "Metrogas, London."

Shipley Gas Supply.

Mr. H. Burton, the Manager of the Shipley Gas-Works, wrote last Friday as follows: "With reference to your paragraph in Tuesday's 'JOURNAL' [p. 259], headed 'Shipley Gas Supply Failure,' it would appear that you have been misled by an exaggerated report in the Bradford papers. Far from being a 'failure,' I am happy to say that it did not become necessary to reduce the pressure of gas at any time below 20-10ths, and only to this extent on one night. It is only fair to this department that the report mentioned should be corrected." It may be stated that the report in question was received in the ordinary way from a local correspondent.

Charge for Gas at Broadstairs.—The Board of Trade are being approached by the Broadstairs Urban District Council on the subject of what they regard as the unreasonable charge that is made for gas by the local Company.

The North Middlesex Gas-Works Strike.—Practically all the men of the North Middlesex Gas Company who struck work in circumstances recorded in the last issue of the "JOURNAL" [p. 259] have now been replaced. Even by the middle of last week it was reported that the gas supply was becoming normal. It was stated that 69 men had been permanently engaged, among whom were several ex-Navy stokers, and that about 50 volunteers were giving their services. Under no circumstances, a representative of the Company, according to "The Times," declared, would the men who came out on strike be reinstated. The Finchley branch of the Middle Class Union organized the voluntary workers; and some of these men, drawn from the professional classes, have been working as many as fourteen hours a day.

Fletcher, Russell, & Co. and Radiation, Ltd.—Circulars have been sent out to the shareholders in Messrs. Fletcher, Russell, & Co., Ltd., of Warrington, setting forth the terms of a scheme whereby the shareholders may exchange their holdings for shares in Radiation, Ltd., which Company already embraces Messrs. John Wright and Eagle Range, the Richmond Gas Stove and Meter Company, and the Davis Gas-Stove Company. The ordinary shareholders of Messrs. Fletcher, Russell, & Co. are offered in exchange for each £1 share of that Company one fully-paid 6 p.ct. cumulative preference share of £1 and one-and-a-quarter fully-paid ordinary shares of £1 each in Radiation, Ltd. The holders of 6 p.ct. cumulative preference shares of £10 are offered the following alternative choice: (A) Ten fully-paid 6 p.ct. cumulative preference shares of £1 each in Radiation, Ltd., and the right to subscribe for four fully-paid ordinary shares of £1 each in Radiation, Ltd., at par, such right to be exercised forthwith, and the ordinary shares subscribed for in the exercise of such right to be paid for in full at the time of application. (B) Eleven fully-paid 6 p.ct. cumulative preference shares of £1 each in Radiation, Ltd., without any option to subscribe for ordinary shares.

A Restricted Supply at Brierley Hill.—The Brierley Hill Gas Company have intimated that, owing to continued insufficient deliveries of coal, they will be reluctantly compelled to further reduce the pressure of gas in the mains, by the adoption of which course it is hoped to maintain a restricted supply until such time as the coal deliveries improve.

Price of Street Lighting at Cannock.—It was reported by the Clerk at a meeting of the Cannock Urban District Council that the Cannock Gas Company were prepared to consent to Mr. B. W. Smith, of Walsall, acting as arbitrator between the Company and the Council, on the question of the price to be paid for street lighting during the present season. The matter was referred to the Lighting Committee.

Improved Coal Position at Wolverhampton.—The position in regard to gas supply in Wolverhampton is at present very good; and a statement made on Saturday by Mr. P. G. Winstanley (the Engineer and Manager of the Gas Company) was to the effect that, instead of the conditions getting worse on account of irregular coal supplies, they had during the last four weeks improved. Coal is now coming in much better than it did a short time ago, and there is no prospect of the town's gas supply being endangered. It has, however, been necessary to draw upon the reserve stocks.

Redcar Gas-Works Purchase.—The *plébiscite* of ratepayers in the Redcar urban district on the question of the proposed purchase of the local gas-works took place last Wednesday. Out of an electorate of over 5000, only about 2200 voted; and the result was: For the purchase, 1199; against, 1005; majority in favour of purchase, 194. The figures relating to Redcar proper showed a majority of four to one against the Council's proposal; but the Coatham and Warrenby districts were strongly in favour of it. It will be remembered that the Council decided, by 11 votes to 1, to acquire the gas-works for £118,000. Led by Councillor T. Phillipson, the one dissentient, a strong opposition was organized; and at a public meeting three weeks ago, the statutory resolution was only carried by a small majority, and a poll of the townspeople was demanded. The opposition had since been very active.

Quality of Dublin Gas.—At a meeting of the Blackrock Urban Council, a letter was read from the Alliance and Dublin Consumers' Gas Company, forwarded through the Board of Trade, dealing with the Council's complaint regarding the lighting power of the gas. The letter stated that up to last September the calorific power of gas the Company were supplying was 450 B.Th.U.; but that in consequence of a Board of Trade Order on coal economy, the power had been reduced to 425 B.Th.U. On the cessation of the Order, the Company went back to the 450 B.Th.U. standard, which power they were now supplying. It was decided to again communicate with the Board of Trade requesting them to take steps to test the gas supply; and, on the suggestion of Lady Dockrell, it was also decided to include some reference to meters—her Ladyship complaining that prepayment meter consumers had now to pay at least 10s. 6d. per 1000 c.ft., instead of 6s. 6d. as formerly.

By Appointment.

CARRON

The Satisfaction

derived from the installation of Gas Appliances in Housing Schemes will be increased if Carron Apparatus are adopted. The leading Housing Authorities recognise this and include "Carron" in their schedules.

The Carron selection embrace every type of Gas Cooking and Heating Appliance and gives satisfying service wherever in use.

Carron Company will be pleased to place their services—without obligation—at the disposal of Local Authorities contemplating Housing Schemes.

¶ *For further Particulars of Carron Gas Appliances, write for a copy of the Company's No. 6B Catalogue, free on request.*

CARRON COMPANY Works: CARRON, STIRLINGSHIRE

Branch Works: Phœnix Foundry, Sheffield.

Showrooms: LONDON—(City) 15, Upper Thames Street, E.C.4; (West End) 50, Berners Street, W. 1. LIVERPOOL—GLASGOW—EDINBURGH—BRISTOL—NEWCASTLE-ON-TYNE and BIRMINGHAM.

No. 650 Gas Cooker, substantially constructed. Maximum ovenspace.

Water Heating Lectures in Dublin.

A special exhibition of water-heating apparatus was given in the show-rooms of the Alliance and Dublin Consumers' Gas Company during the week ending Jan. 31. On the Wednesday evening, a lecture, supplemented by lantern slides, on "Gas-Fired Water-Heating Apparatus as Applied to Housing Schemes," was given by Mr. A. H. St. Leger (Water Heating Engineer to the Richmond Gas Stove and Meter Company), to the architects, &c., of the district. Mr. J. A. Gray (the Secretary of the Gas Company), who presided in the unavoidable absence of the Chairman, after introducing the lecturer, spoke of the importance of the subject, the advantages of gas for heating water for domestic purposes, and the facilities given to consumers by the Gas Company for either the purchase or hire of the apparatus. At the close of the lecture, Mr. H. F. Cotton (the Distribution Engineer), in moving a vote of thanks to Mr. St. Leger, dealt shortly with some of the points raised, and invited the audience to make the fullest inquiries. The following evening Mr. St. Leger gave a lecture to the fitters and plumbers of the Gas Company. The theory and practice of water heating were thoroughly dealt with; the lantern slides being well chosen to illustrate the difficulties the fitters would meet in their everyday work. An enthusiastic discussion at the close of the lecture proved the interest in the proceedings.

Kilkenny Gas Prices.—A meeting of Kilkenny gas consumers has been held, under the presidency of the Mayor, to prepare evidence to be submitted at a Local Government Board arbitration into the local Gas Company's application to the Corporation to agree to an increase in the price of gas. The Mayor pointed out that the Corporation did not think they would be justified in consenting to an increase without consulting the gas consumers. The matter was then dealt with in committee.

Cost of Prepayment Supplies.—Mr. Doran, in the Belfast Corporation, raised the question of the revised prices of gas, and drew attention to the fact that the prepayment consumers were being charged 7½d. per 1000 c.ft. more than the users of ordinary meters. He moved that they be charged at the same rate as users of ordinary meters. Mr. J. D. Smith (the Gas Engineer) said there had been no increase in the price to prepayment consumers since October, 1918; while there had been two increases to ordinary consumers, amounting in all to 8d. per 1000 c.ft. Prepayment meters were not changed owing to the heavy outlay, and because of the scarcity of materials. At present it was costing the Corporation 10d. per 1000 c.ft. more to supply gas through prepayment meters than to ordinary consumers, so that, even with the difference of 7½d. which had been mentioned, these consumers were getting an advantage. Mr. Houston said if there was no other way out of the difficulty, Mr. Smith should be instructed to substitute ordinary meters for all existing prepayment ones. On the suggestion of Alderman Sir James Johnston, it was agreed to refer the matter to the Gas Committee.

Leeds and Coke-Oven Gas.—At the Leeds City Council meeting last week, Alderman Penrose Green, the Chairman of the Gas Committee, said arrangements had been made to use coke-oven gas from the Middleton Colliery Company. He regretted the Committee had been compelled to refuse an offer from the Yorkshire Coking Company to bring coke-oven gas from Glassboughton—the price being considered to be too high.

Sunderland Gas Company's Profits.—An interesting sequence to the discussions in the Sunderland Town Council recently on the proposed purchase of the Gas Company (which was defeated) took place in the Finance Committee of the Corporation, when Dr. Gordon Bell, who had asserted that the Company had used £153,000 surplus profits during a long period of years to purposes without legal sanction, moved a resolution that steps be taken, by application through Quarter Sessions, to secure the holding of an audit of the accounts of the Company with a view to seeing that they devote their surplus profits in future to reducing the price of gas to the consumers, as provided for in their Act of Parliament. After some discussion, the resolution was defeated.

The Coal Rebate and Temporary Increase of Charges Act.—The Hammersmith Borough Council General Purposes Committee, regarding a protest against gas charges, report the receipt of a letter from the Public Utilities Department of the Board of Trade, stating that the price chargeable for gas supplied by the Brentford Gas Company is limited, by an Order made by the Board on Nov. 4 last, under the Statutory Undertakings (Temporary Increase of Charges) Act, 1918, to 4s. 10d. per 1000 c.ft. The Board state that the Order was made after full consideration of the financial circumstances of the Company; but they add that, in view of the recent reduction in the price of coal supplied to gas undertakings for producing gas used for domestic purposes, they have under consideration the question whether any, and, if so, what, modifications should be made in this and similar Orders under the Act.

Strike Threat in South Wales.—Some thousands of gas-works employees throughout South Wales are affected by notices which were sent out on Friday to all owners, whether private or municipal, to cease work within fourteen days unless the men's demands are conceded. At a meeting of the South Wales Regional Council on Dec. 15 last, certain proposals were submitted to the employers' section, embodying demands for the consolidation and merging of all war wages, bonuses, and premiums into a standardization of wages; to have uniform wages and bonuses in all works, while certain claims were put in for overtime and the recognition of payment for holidays. To some of the requests counter-proposals were made by the employers; but on consideration the employees' side were unable to agree, and the meeting was adjourned to allow each side to report to its Executive—a further meeting being arranged. Later the employers were informed that their offer could not be accepted, and it was decided to tender fourteen days' notice in order to press the whole of the original claims. It is hoped that a stoppage will be averted.

Gas Plant and all constructional Steel and Iron Work.

Specialists in Slot Meters, Ordinary Meters, Wet & Dry.

WILLEY & CO., LTD., ENGINEERS,

EXETER, LONDON,

MANCHESTER,

LEICESTER.

The Pioneers of Slot Installations.

Gas Fittings.

Gas Fires.

Gas Cookers.

PICKERING'S VALVE. LIVESEY WASHERS.

Telegrams:
"WILLEY, EXETER."
"GASVILLADO, KINLAND, LONDON."
"METERS, LEICESTER."
"WILMETER, MANCHESTER."

Telephone Nos.:
139 EXETER
324 DALSTON, LONDON.
4277 LEICESTER.
7419 CITY, MANCHESTER.

NOTE ADDRESSES.

Head Offices: EXETER.
London Works and Offices:
89-95, HERTFORD ROAD, KINGSLAND, N.
5, Oxendon Street, LEICESTER.
John Street, Booth Street West, MANCHESTER, S.W.

Dublin Gas Leakage Fatality.—Three men, while working at a sewer in Adelaide Street, Dublin, were overcome by gas fumes from, it was believed, a burst in one of the Alliance and Dublin Consumers' Gas Company's pipes. The men were removed to hospital, where one died. A spectroscopic examination of the blood showed that death was due to carbon monoxide poisoning. It was stated that the men knew there was a leak, as another employee had left to report the matter to the Engineer.

The Lighting of Sligo.—The Sligo Corporation's Sub-Committee on Improved Lighting having made a general inspection of the lighting system, gave instructions to Mr. Browne, the Manager of the Sligo Gas Company, to proceed with certain alterations in various parts of the town. They expressed a strong opinion that the Gas Company's arrangement for the non-lighting of many lamps when, according to the calendar, the moon was supposed to be at "full," should be revised, if not entirely discontinued, especially in the months of November, December, and January.

"Death from coal-gas poisoning" was the verdict returned by a Belfast Coroner's Jury, in the case of Maria Gray (aged 77). It had been proved that there was an escape of gas from a stove in her bedroom.

The West Bromwich Town Council have advanced the price of gas 6d. per 1000 c.ft., with a rebate of 8d. off all accounts where the gas is used for domestic purposes; and the Urban District Council at Oldbury have increased the price from 5s. to 5s. 6d. per 1000 c.ft.

The Burnley Gas Committee have considered a report from the Engineer (Mr. J. P. Leather) showing that the cost of haulage by steam-wagon from Oct. 23 to January last was less than one-half the cost per ton which horse haulage averaged the previous year. The Committee have decided to purchase another steam coke wagon.

A fire-raker named John Fullick, engaged at the Vauxhall works of the South Metropolitan Gas Company, was standing at the side of an arch when a look-out man shouted to warn him of the approach of a light engine attached to three trucks. Fullick did not hear the warning, and was unhappily crushed to death between the engine and the wall.

The Halifax Gas and Electricity Committees have appointed a joint deputation, together with certain people outside the Council who have special knowledge, to visit various towns and study the best methods of utilizing gas in connection with the gas and electricity undertakings. The Town Council, after a discussion, approved the scheme.

Mr. F. Thorpe (the Gas Manager) reported to the Colne Town Council that the gas plant had been overworked for some time, and recommended that the works be put on a manufacturing basis of 1½ million cubic feet per day. He also enumerated the additional plant required. A Special Committee was appointed to consider the recommendations, and to present a full report to the Council on the scheme of extensions.

Messrs. John Terry & Co., of No. 7, Great Winchester Street, E.C. (as Agents for the Company) have received advice by cable that the profits of the Metropolitan Gas Company of Melbourne, for the half year to Dec. 31 last were £49,143. A dividend of 6s. 6d. per share has been declared for the six months, the sum of £10,000 has been transferred to the reserve fund, and a balance of £51,878 has been carried forward. Dividend drafts to absentee shareholders will be posted by an early mail.

The Bradford Corporation gas inspectors held their annual social on Wednesday last; tea being provided at the Co-operative Café and the concert and social following at the Gas-Workers' Club. In the course of the evening an ebony walking stick was presented to Mr. F. Senior, who retires from his position of Superintendent after fifteen years' service in that position and a total of 44 years' service to the Gas Department. The presentation was made by his successor in office, Mr. A. H. Scurrah, on behalf of his colleagues.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official List" for Feb. 4.]

Nos. 2342—3082.

ABRAHAMS, E.—"Internal-combustion engines employing producer gas as fuel." No. 2797.
AVELLANA, L.—"Wood-gas producer." No. 2718.
BAMBER, H. W.—See Abrahams. No. 2797.
BARTLETT, A. J.—"Incandescent burners." No. 2468.
BENNETT, C. H.—"Gas-mixers." No. 2706.
CARBONE, T. L.—"Internal-combustion gas-engine of different piston type." No. 2970.
CHAMNEY, N. P.—"Manufacture of ammonium polysulphide." No. 2766.
EDWARDS, A. M. P.—"Lighting or ignition apparatus for gas-burners, &c. No. 2892.
GRAHAM, T.—"Burners for incandescent gas lighting." No. 2794.
GREEN, F. I.—"Lighting fixtures." No. 2427.
HATTON, E.—"Gas-stoves." No. 2391.
HILLYARD, O.—"Key and valve for interrupting supply of fuel in gas, &c., engines." No. 2656.
LINDEN, L.—"Apparatus for treating affluent, &c., and for separation and recovery of matters of different densities." No. 2695.
MOLL, A. D.—"Burners for incandescent gas lighting." No. 2794.
OLIVER, A. M.—"Gas-stoves." No. 2391.
SHAW, H. S. HELE.—"Pipe-joints." No. 2600.
SHEARD, J. T.—"Making neutral sulphate of ammonia." No. 2880.
SVENSKA AKTIEBOLAGET MONO.—"Gas-analyzing apparatus." No. 2680.
TRIBE, E.—"Pipe-joints." No. 2600.

WELSBACH
INDOOR PRE-HEATED LAMP.

WHITE ENAMELLED CASING.

FITTED WITH 3 MEDIUM SIZE INVERTED BURNERS ARRANGED WITH PRE-HEATED CHAMBER AND WITH GAS AND AIR ADJUSTMENT.

NO INNER GLASSES REQUIRED.

W 667.

Length over all 15 ins.
Diameter . . 11 ins.

WELSBACH
BRITISH MADE
INDOOR LAMPS

W 668.

Length over all 18½ ins.
Diameter . . 14 ins.

WHITE ENAMELLED CASING.

FITTED WITH 3 ANGLE UNIVERSAL SIZE INVERTED BURNERS, WITH GAS AND AIR ADJUSTMENT.

NO INNER GLASSES REQUIRED.

Catalogue & Prices on application.

ADVT. OF THE WELSBACH LIGHT COMPANY, LIMITED, WELSBACH HOUSE, KING'S CROSS, LONDON, W.C. 1.

Denton's Gas Supply.—At a meeting of the Denton Town Council last Wednesday, it was stated that the quality of the gas had become so bad that tradesmen had had to supplement it with lamps and candles, and even electric torches. The Gas Manager (Mr. H C. Handley) explained that the gas failed altogether the previous week, owing to the fact that they had to supply 215,000 c.ft. more than the works could make. Gas had now to be manufactured on Saturday afternoons and Sundays. When the new plant got going, he added, matters would improve.

Dudley and Gas-Works Municipalization.—At a meeting of the Dudley Town Council last Tuesday, Mr. Norton asked what action had been taken in regard to the resolution from the local Trades Council, in favour of the municipalization of the gas undertaking. Mr. S. C. Lloyd said the Committee came to the conclusion that it would not be financially sound to buy the gas-works, and asked the Trades Council to show them how the concern could be made economically a good thing for the town. It was also announced that the recent decrease in coal would have the effect of reducing the price of gas for domestic use by 6d. per 1000 c.ft.

Vertical Retorts for Neath.—The Neath Town Council last Thursday adopted a recommendation of the Gas Committee asking for tenders for new works in connection with the gas undertaking. Alderman Morgan Hopkins (the Chairman of the Gas Committee), in moving the adoption of the report, stated that the proposed new works included carbonizing plant and vertical retorts. The district, he said, was rapidly growing, more especially in the direction of Port Talbot; and it was necessary that they should meet this increasing demand.

Salford Gas Inquiry.—Mr. Greenwood, at a meeting of the Salford Town Council last Wednesday, proposed the appointment of a Gas Undertaking Inquiry Committee, consisting of a number of aldermen and councillors; but many of the members who were mentioned in connection with the proposed Committee asked that their names should be struck off the list. Mr. Gorman expressed the opinion that the inquiry should be made by experts, and should be an open one. On the suggestion of Alderman Worsley, seconded by Sir William Stephens, it was resolved that the appointment of a Committee be deferred until the Gas Committee had issued to the Council a report on the work of the undertaking.

STOCK MARKET REPORT.

THE general tone of things on the Stock Exchange last week was rather depressed. The dulness extended to pretty well every market, although not all departments were equally affected. The main factor of depression was the parlous financial condition of the greater part of the world, with the steady and apparently interminable fall of exchange in all quarters. The best that can be said is that symptoms of a rally to some extent were discernible before the close.

In the gilt-edged market, Home Government issues (excepting Victory) were very flat; Consols changing hands at the record price of 49⅝. Friday's closing prices were: Consols 49⅝-50¼, War Loan 90¼-90¾, Funding 73-73⅜, Victory 82¼-83. Some new Colonial issues were in request, and Indian rupee loans rose.

Home Rails moved irregularly, apparently taking little heed of the good dividends that were announced. Canadians and Argentines were quite firm.

The Foreign Market was not strong. French Loans moved up and down, rallying somewhat at the close. Some Japanese and Brazilian were firm.

In the Miscellaneous Market there was less disposition to launch out speculatively. Rubbers moved somewhat irregularly, Oils were easier, and Shipping was out of favour. South Africans, however, profited by the advance in gold.

Business in the Gas Market was on a reduced scale, and was largely confined to the three largest undertakings. Of the rest, those which were dealt in at all might be counted on the fingers. There were few changes in quotations. In the Home Companies, Gas Light maximum fell 1. In Continentals, Imperial was weak, gradually slipping away from a mark of 143 on Monday to one of 136 on Friday. Primitivas were easier, and the ordinary shares were quoted ¼ lower.

Bargains done for cash during the week were as follows: On Monday, Brentford "B" 46, British 26½, Gas Light ordinary 54, 54½, 54⅝, 55, 55¼, 55⅜, 55½, ditto maximum 40, ditto debenture 51, Imperial Continenal 140, 141, 142, 142½, 143, Primitiva 35s., 36s. 3d., South Metropolitan 56, 56½, 57, Portsea "D" and "E" 51½. On Tuesday, Brentford "A" 50, ditto "B" 46, Gas Light ordinary 54⅜, 55, 55¼, 55⅜, ditto maximum 40, ditto debenture 51¼, 51½, Imperial Continental 140, 142, Primitiva 32s. 6d., South Metropolitan 56½, 57, ditto debenture 50. On Wednesday, Alliance and Dublin 45, Gas Light ordinary 55½, 55⅜, 56, ditto preference 62, 62½, 63½, 64, ditto debenture 50, Imperial Continental 137, 138, 138½, Primitiva 33s. 9d., 35s., ditto preference 67s. 6d., ditto debenture 71, 71½, South Metropolitan 56½, 56⅝, 57. On Thursday, Alliance and Dublin 45, Commercial debenture 50, European 9½, 9⅝, Gas Light ordinary 55⅛, 55⅜, 56, ditto preference 62½, 62⅝, ditto debenture 51½, Imperial Continental 136, 137, 137½, 138, 139, Primitiva 34s. 9d., ditto preference 66s. 3d., South Metropolitan 57, Tuscan 1¼. On Friday, British 26½, European 9⅜, 9⅜½, Gas Light ordinary 55½, 55⅝, ditto debenture 51½, Imperial Continental 136, 136½, 138, Monte Video 73, South Metropolitan 56½, 56⅝, 57¼, 57½.

In the Money Market, the position for the first day or two was quite easy; but a change rapidly set in, and an increasing demand conjoined with a paucity of supplies hardened rates considerably. Silver has risen to 89d.—a new record. The Bank rate is 6 p.ct., as fixed on Nov. 6, 1919.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue. £	Shares.	When ex-Dividend.	Ante-War Dividend & Bonus. p.c.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
128,049	Stk.	July 31	4	4%	Aldershot 4 p.c. Pref.	..	60—65	..
1,551,958	"	Sept. 26	2½	2½%	Alliance & Dublin Ord.	39—34	43—48	45
374,000	"	Jan. 15	4	4%	Do. 4 p.c. Deb.	76—79	61—63	..
250,000	5	Oct. 30	7½	8%	Bombay, Ltd.	5⅝—6	5—5½	..
50,000	10	Aug. 28	16	12%	Bournemouth Gas and Water { 10 p.c. B 7 p.c. Pref. 5 p.c. 4 p.c. Deb.	20—22	19—20	..
868,110	10	"	7	7%		15—15½	10—11	..
115,300	10	"	6	6%		13½—14	9½—9⅞	..
159,740	—	Dec. 30	—	4%		..	64—66	..
998,045	Stk.	July 11	14	80/-†	Brentford A Consolid.	261—266	60—65	50
784,980	"	"	11	26 8†	Do. B New	204—209	45—50	46
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	76—78	..
221,400	"	Dec. 11	4	4%	Do. 4 p.c. Deb.	91—93	64—66	..
214,775	"	Sept. 11	11	7½%	Brighton & Hove Orig.	208—213	123—128	..
244,260	"	"	8	5½%	Do. A Ord. Stk.	154—159	84—89	..
933,500	Stk.	—	5	5%	Bristol 5 p.c. max.	..	..	..
680,000	10	Sept. 26	12½	10%	British	44—45	25—27	26½
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	61—63	..
245,771	"	"	4	4%	Buenos Aires 4 p.c. Deb.	85—87	47—50	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2¼	6½—7½	..
180,000	10	Oct. 30	—	4½%	Do. 4½ p.c. Pref.	4—6	6½—7	..
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—76	58—63	..
187,150	"	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	..
1,518,280	"	Aug 14	5/9/4	88/4	Commercial 4 p.c. Stk.	106—108	56—61	..
850,000	"	"	6½	26/8	Do. 3½ p.c. do.	108—105	51—56	..
475,000	"	Dec. 11	8	8%	Do. 3 p.c. Deb. Stk.	69½—71½	49—51	50
800,000	"	"	4	—	Continental Union Ltd.	76—79	30—35	..
200,000	"	"	7	—	Do. 7 p.c. Pref.	115—118	40—60	..
51,600	Stk.	Aug. 28	14½	12%	Croydon A 10 p.c.	..	135—145	..
378,406	—	"	11½	9%	Croydon B and C 7 p.c..	..	95—105	..
402,270	Stk.	—	6	6½%	Derby Con. Stk.	125—125	..	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	..	..
1,009,180	10	Jan. 29	10	8/0	European, Ltd.	17¾—18	9⅜—10⅜*	9⅜—9⅝
16,298,975	Stk.	July 30	4/17/6	80/-	Gas { 4 p.c. Ord.	98—102	54—57	54—56
2,600,000	"	"	8½	26/8	Light { 3½ p.c. max.	76—79	40—45	40
4,069,235	"	"	4	4%	and { 4 p.c. Con. Pref.	96—99	62—65	62—64
4,674,850	"	Dec. 11	8	8%	Coke { 3 p.c. Con. Deb.	72½—74½	50—53	50—51½
180,000	"	"	10	10%	10 p.c. Bonds	..	..	..
82,500	"	Sept. 11	5	4½%	Hastings & St. L. 5 p.c.	..	57—62	..
258,740	"	"	8½	2½%	Do. 3½ p.c	37—39	40—45	..
70,000	10	April 29	11	7%	Hongkong & China, Ltd.	16½—18½	8½—9½	..
86,600	Stk.	Aug. 28	9	8½%	Hornsey 7 p.c.	..	90—95	..
181,000	"	Sept. 11	7½	5½%	Ilford A and C.	151—154	88—98	..
65,780	"	"	6½	4½%	Do. B	115—118	67—72	..
85,500	"	Dec. 30	4	4%	Do. 4 p.c. Deb.	93—94	59—63	..
4,948,000	"	May 14	9	4½%	Imperial Continental	150—150	135—140	136—143
1,985,000	"	Aug. 14	8½	8½%	Do. 3½ p.c. Deb. Red.	84—86	87—92	..
255,343	"	Sept. 11	6½	6½%	Lea Bridge Ord. 5 p.c.	119—121	86—91	..
2,498,986	"	Feb. 26	10	42/6	Liverpool 5 p.c. Ord. { A B	911—913 146—148	..	..
808,088	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	..	..
166,736	"	Aug. 14	7/5/6	85%	Maidstone 5 p.c.	..	56—61	..
75,000	5	June 11	6	5%	Malta & Mediterranean	4½—4¾	1⅞—2¼	..
250,000	100	Oct. 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	90—97	..
541,220	Stk.	Nov. 27	4	5%	Monte Video, Ltd.	11½—12	70—75	73
1,875,393	"	July 30	4½	8½%	Newcastle&Gateh'dCon.	93½—93¾	66—67	..
529,705	"	Dec. 30	8½	8½%	Do. 3½ p.c. Deb.	61—63	55½—56½	..
15,000	10	Sept. 11	—	11%	North Middlesex 10 p.c.	..	13½—13⅝	..
55,940	10	"	7/14/0	7½%	" " 7 p.c.	14—15	9—9½	..
800,000	Stk.	Nov. 27	8	8%	Oriental, Ltd.	117—122	102—105	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	4½—4¾	6½—7	..
60,000	50	Aug. 28	18	7½%	Portsea, Island B	138—131	60—65	..
100,000	50	"	12	6½%	Do. C	118—121	64—67	..
249,980	5	April 29	8	—	Primitiva Ord.	5½—6	1½—2	32/6—36/3
499,960	5	June 26	5	—	Do. 5 p.c. Pref.	4¾—5	8½—8⅝	66/8—67/6
521,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb.	91—93	70—72	71—71½
600,000	Stk.	Jan. 29	4	4%	Do. " " 1911	..	48—51*	..
846,198	"	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	47—50	..
150,000	10	Sept. 26	6	6/-	San Paulo { 6 p.c. Pref.	10¾—11	7⅛—8	..
125,000	50	Dec. 30	5	5%	{ 5 p.c. Deb.	47—49	39—41	..
185,000	Stk.	Aug. 28	10	5%	Sheffield A	228—234	75—80	..
209,984	"	"	10	5%	Do. B	228—234	75—80	..
528,800	"	"	10	4½%	Do. C	230—229	75—80	..
135,301	Stk.	Sept. 12	4	4%	Shrewsbury 5 p.c.	..	..	..
90,000	10	Oct. 15	9	10%	South African.	10½—11½	12—13	..
5,509,895	Stk.	Aug. 14	8/4/0	80/-	South Met. 4 p.c. Ord.	111—113	55—58	56—57½
250,000	"	Jan. 15	—	5%	Do. Pref.	..	93—95	..
1,895,448	"	"	8	8%	Do. 5 p.c. Deb.	73½—74½	60 62	60
234,230	"	Aug. 14	8½	5%	South Shields Con. Stk.	151—159	105—107	..
952,796	"	"	6	8½%	S'th Suburb'n Ord. 5 p.c.	114—118	68—73	..
197,558	Stk.	Dec. 30	6	5%	Do. 5 p.c. Deb. Stk.	116—118	78—83	..
647,140	"	Nov. 13	7½	8½%	Southampton Ord.	99—102	61—68	..
121,375	"	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	..	61—63	..
120,000	"	Aug. 14		88½‡		135—138	70—75	..
784,275	"	"	6	2½%†	Tottenham { A 5 p.c. District { B 3½ p.c. 4 p.c. Deb.	115—117	60—65	..
181,365	"	Dec. 11	4	4%		87—89	63—65	..
129,880	10	Dec. 30	5	—	Tuscan, Ltd.	5—8	1—2	1½
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	45—50	..
286,476	Stk.	Sept. 26	5	3½%	Tynemouth 5 p.c. max..	103½—109	74—76	..
80,000	"	Aug. 28	8½	65/-	Wandsworth, Wimbledon, and Epsom—			
266,586	"	"	6½	40/-	Wandsworth A 5 p.c..	151—156	85—90	..
108,075	"	"	—	88/6	Do. B 3½ p.c.	128—134	63—68	..
140,865	"	"	—	88/6	Do. C	..	63—68	..
889,000	"	"	6½	89/9	New Ordinary	..	63—68	..
98,000	"	"	6½	40/-	Wimbledon 5 p.c.	117—122	65—70	..
88,418	"	Dec. 30	8	8%	Epsom 5 p.c.	121—126	65—70	..
					5 p.c. Deb. Stk.	86—89	48—50	..

* Ex Div. † Next dividend will be at this rate.

OXIDE OF IRON
FOR SALE OUTRIGHT, OR ON LOAN.

SPENT OXIDE
PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO. LTD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C. 2.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

MEWBURN, ELLIS, & CO.,
CHARTERED PATENT AGENTS AND
TRADE MARK AGENTS,
70 & 72, Chancery Lane, London, W.C. 2.
Telegrams: "Patent, London." Phone 248 Holborn.
And 3, St. Nicholas Buildings, Newcastle-on-Tyne.

TULLY'S PATENT.
CARBURETTED HYDROGEN PLANT
for 300 to 500 B.Th.U.
COMPLETE GASIFICATION OF COAL.
BALE AND HARDY, LTD.,
39, VICTORIA STREET, LONDON, S.W. 1.

SULPHURIC ACID.
SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENSER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD., Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN, LONDON."
Telephone—1588 AVENUE (3 lines).

"FERROX." "FERROX." "FERROX."
A BRITISH Oxide Cheaper and Better than Bog Ore. 35 per cent. Water, 75 per cent. Ferric Hydrate.
For Sale outright or on Loan.
OXIDE LIMITED, Brentford, MIDDLESEX.

SPENCER'S Patent Inclined HURDLE GRIDS.
THE very best Patent Grids for Holding Oxide Lightly.
See Illustrated Advertisement Nov. 18, p. 405.

ALDER AND MACKAY, LTD.
(ESTABLISHED 1850.)
WET AND DRY METERS,
SLOT AND ORDINARY.
STREET LAMPS AND AUTOMATIC CONTROLLERS.
EDINBURGH.
(See p. 336.)

J. E. C. LORD, Ship Canal Tar Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

SULPHATE OF AMMONIA
SATURATORS and all LEAD and TIMBER WORK in connection with Sulphate Plants.
We Guarantee promptness with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CHEMICAL PLANT ENGINEERS, BOLTON, LANCS.
Telegrams—"SATURATORS, BOLTON," Telephone 0848.

BRITISH LUX.
AN EXCELLENT PURIFYING MATERIAL.
Features:—
(a) Porosity equal to Best Bog Ore.
(b) Contains Ferric Hydrate in an active state, thus resembling "Lux."
(c) Prepared in good mechanical condition ready for Purifiers.
DANIEL MAGNIE, 1, NORTH ST. ANDREW STREET, EDINBURGH.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. 1.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB, LONDON."

BENZOL PLANTS FOR GAS-WORKS.
BAGLEY, MILLS, & CO., Ltd.,
92, Victoria Street, Westminster, S.W. 1, Invite inquiries from all Gas-Works making 75 million cubic feet and upwards per annum.

INVENTIONS PATENTED. TRADE MARKS REGISTERED.
Advice and Handbook free. 35 years' references. Gas Patents a Speciality. KING'S PATENT AGENCY, Ltd. (Director, B. T. King, A.I.M.E., British and U.S. Regd. Patent Agent), 165, QUEEN VICTORIA STREET, LONDON, E.C. 4.

NATIONAL ASSOCIATION OF TECHNICAL GAS OFFICIALS.
Head Office: 109, Exchange Buildings, Birmingham.
Full Particulars and Membership Forms may be obtained from the GENERAL SECRETARY.

APPOINTMENTS, &c., VACANT.

WHEN Filling Vacancies, please REMEMBER THE CLAIM OF THE EX-SERVICE MAN, who, other Qualifications being equal, has the FIRST CALL ON YOUR CONSIDERATION.

WANTED for the Waterford Gas Company, an ASSISTANT MANAGER. Salary, £300 per Annum.
Applications, stating Age, &c., with Testimonials, to Messrs. ANDERSON BROS., 5, VICTORIA STREET, WESTMINSTER, S.W. 1.

WANTED by a Gas Undertaking in the South of England, an Experienced DISTRIBUTION INSPECTOR with Practical Training.
Apply, by letter, in first instance, giving full Particulars of Experience and Salary required, to No. 6841, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

COUNTY BOROUGH OF STOKE-ON-TRENT.
(GAS DEPARTMENT).
THE Gas Committee require the services of a CHIEF DISTRIBUTION SUPERINTENDENT to Take Control, under the Chief Engineer, of the Distribution Department.
Applicants must be experienced in all up-to-date methods of Distribution, including High-Pressure Supply, and be capable of Advising Consumers in the use of Modern Gas Appliance.
It is preferred that Applicants shall have had Experience as Distribution Superintendents. Salary, £460 per Annum.
Applications, stating Age, Experience, accompanied by *copies* of three recent Testimonials, to be sent to the undersigned, endorsed "Chief Distribution Superintendent," on or before the 6th of March, 1920.
A. MACKAY,
Chief Engineer and General Manager.
Gas Offices, Longton,
Stoke-on-Trent.
Feb. 6, 1920.

TOWN OF DUDLEY GAS LIGHT COMPANY.
JUNIOR TECHNICAL ASSISTANT.
A JUNIOR Technical Assistant is required, capable of carrying out the usual Gas-Works' Tests and Working Drawings. He would also be required to assist in the Management of the Works. Preference will be given to Applicants Trained on a similar or smaller sized Works, and who have received Practical Training in the Shops.
Applications, stating Age, Experience, and Salary required, must reach the undersigned by noon on Saturday, the 14th of February next. They may be accompanied by *copies* of Testimonials; but these are not essential in the first place.
FRAS. C. BRIGGS,
Engineer and Manager.
Gas-Works, Spring Gardens,
Dudley, Worcs.

OXIDE OF IRON.
SPENT OXIDE BOUGHT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

"KLEENOFF," THE COOKER CLEANSER.
Tins for Sale to Consumers.
In Bulk for Works Use.
BALE & CHURCH, LTD.
33, ST. MARY AT HILL, LONDON, E.C. 3.
Phone: Avenue 6680.

BRITISH GAS PURIFYING MATERIAL.
ENGLISH BOG ORE AND NATURAL HYDRATED OXIDE OF IRON.
SPENT OXIDE BOUGHT.
BRITISH GAS PURIFYING
MATERIALS CO., LTD.
(W. T. P. CUNNINGHAM, Chief Proprietor and Managing Director.)
13, ARCADIAN GARDENS, WOOD GREEN, LONDON, N. 22.
Telegrams: "Briparimat, Wood, London."
'Phone: Palmers Green 608.

CORPORATION OF BIRKENHEAD.
(GAS DEPARTMENT.)
AN Assistant Chemist required at once. Must be capable of performing all Gas-Works Tests and Analyses, with Works Experience preferred.
Salary £150 per Annum, with Bonus awards for the time being in force equals £242 per annum, *plus* four annual increments of £10 per annum.
Applications, stating Age, Experience, Qualifications, with *copies* of Testimonials, to be sent in on or before Feb. 21, 1920, to R. H. BROWN, M.I.Mech.E., Gas Engineer, GAS-WORKS, BIRKENHEAD.

DRAUGHTSMAN Wanted, to act also as CLERK OF WORKS during Alterations at Midland Gas-Works for a Minimum Period of Twelve Months.
Apply, stating Age, Qualifications, and Weekly Salary required, to No. 6839, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

SWADLINCOTE DISTRICT URBAN DISTRICT COUNCIL.
(GAS-WORKS.)
GENERAL Foreman Wanted at once for the above Works.
Apply, giving Age, Experience, and Wages required.
F. ROBINSON,
General Manager.
Gas-Works, Belmont Street,
Swadlincote,
Near Burton-on-Trent.

WANTED—Experienced Clerk for Gas Office. Should be capable of TAKING ENTIRE CHARGE of Rental and Other Ledgers and generally conversant with the usual routine of a Gas Office.
Applications, accompanied by *copies* of Three Testimonials, stating Age and Salary required, and also the earliest date at liberty, to be addressed to Mr. A. E. BROOKS, GAS-WORKS, ASCOT, BERKS.

WANTED — Three Stokers, with Knowledge of Boilers and Exhauster. Hand Charging. Eight Hour Day. Seven Days, with Relief. Applications from Single Men only (owing to Housing Difficulty) can be considered.
Fuller Particulars can be obtained from the MANAGER Halstead Gas Company, Ltd., 3, Bridge Street, HALSTEAD, Essex.

APPOINTMENTS, &c., WANTED.

ADVERTISER desires Post of Engineer and MANAGER of 70 to 100 Million Gas-Works. Has over Nine Years' Similar Experience covering both Manufacturing and Distribution Departments. Alternatively, would take Post of ASSISTANT on larger Works. Excellent References.
Address No. 6832, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

ADVERTISER, of Good Education, Discharged from Military Service, SEEKS APPOINTMENT with Gas or Water Undertaking, Home or Abroad, as ASSISTANT SECRETARY, ACCOUNTANT, CASHIER, &c. Fourteen Years' Practical Experience (Age 30).—Address No. 6830, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

ROBERT DEMPSTER & SONS, Ltd., ELLAND, Gas Engineers and Contractors for CARBONIZING PLANTS on Horizontal or Vertical Principles, and Stoking Machinery. HANDLING INSTALLATIONS, including Coal Breaking, Elevating, Conveying Plants and Coke Screening, Storing and Telpherage Plants. PURIFICATION.—All Branches of Wet and Dry Purification. STORAGE.—Gasholders, and all forms of Gas Apparatus. Wire: "DEMPSTER, ELLAND." 'Phones: ELLAND 261, 262, 263.

PLANT, &c., FOR SALE & WANTED.

DEMPSTER'S Reciprocating EXHAUSTERS, Direct Acting Pump Type. One Set to Pass 100,000 c.ft. per hour, and one Set to Pass 60,000 c.ft., both Steam Driven; also one Belt-Driven Set to Pass 20,000 c.ft. Gives Steady Gauge, and will Pump against Heavy Pressure.
For Particulars and Prices apply FIRTH BLAKELEY, SONS, AND CO., LTD., CHURCH FENTON, *via* LEEDS.

TANK Wagons required, suitable for Main Line Traffic. HIRE or PURCHASE.
State Terms to No. 6842, care of Mr. KING, 11, Bolt Court, FLEET STREET, E.C. 4.

MACHINE TOOLS for Immediate Delivery—
One New Brown and Sharpe No. 14 Plain GRINDING MACHINE, 18 in. by 30 in.
One No. 3A Warner & Swasey Auto TURRET LATHE. All-Geared Head, as new.
Six No. 9 Herbert TURRET LATHES. All-Geared head, 3½ in. hole through Spindle (without Cross-Slides). Good Condition.
One 1½ in. capacity Foster TURRET LATHE, Bar Feed, Cut-off Rest, Pump. Good Condition.
One New 1½ in. capacity Foster CAPSTAN LATHE, 8½ in. Centres, Bar Feed, Cut-off Rest. Pump.
Two New Cincinnati Acme CAPSTAN LATHES, 1½ in. capacity. Auto feed to Capstan.
Seven New Wells CAPSTAN LATHES, ¾ in. capacity, ⅝ in. hollow Spindle.
One 1⅜ in. Dreses CAPSTAN LATHE, with Chasing Arm, Taper Attachment. Good Condition.
One 1 in. Dreses CAPSTAN LATHE. Good Condition.
One New Richards Type Turret BORING LATHE, admit 38 in. diameter in Gap.
One 26 in. swing Darling & Sellars BORING and SURFACING LATHE, 8 ft. bed, as new.
One 10½ in. by 10 ft. Straight Bed S.S.S. and Screw-Cutting LATHE by Dean Smith and Grace, Pump, Chuck. Very Good Condition.
Two 12 in. by 14 ft. Straight Bed Sliding and Surfacing LATHES by Stirk. Double Back Geared. Fair Condition.
Three New 9½ in. by 8 ft. Straight Bed S.S.S. and Sc. LATHE, PUMP, and CHUCK.
Two 8 in. Centre by 6 ft. bed Lang S.S.S. and Sc. LATHES, as new.
Six 10½ in. Centre by 10 ft. straight bed Lang S.S.S. and Sc. LATHES, as new.
One 18½ in. Centre by 16 ft. straight bed Lund S.S.S. and Sc. LATHE, as new.
Several 6½ in. by 6 ft. straight bed American LATHES. Second-Hand.
Four 10½ in. Centre by 11 ft. 6 in. straight bed S.S.S. and Sc. LATHES by Darling and Sellers. Very Good Condition.
One 24 in. Bullard VERTICAL BORING and TURNING MILL, with Tool Holders and Side Saddle, as new.
One 16 in. stroke SHAPING MACHINE. New.
One New RING GRINDER, with 8½ in. Magnetic Chuck.
Two New Universal Tool and Cutter GRINDERS.
Five Wet Tool GRINDERS, as new.
COLUMN DRILLS, TOOL SHARPENERS, CUTTER GRINDERS, BACKING-OFF ATTACHMENTS, CHUCKS, VICES, HACKSAW BLADES.
Full Particulars on application to—
THE JUDSON-JACKSON COMPANY, LTD., 50, MARSHAM STREET, WESTMINSTER, LONDON, S.W. 1.

CONTRACTS OPEN.

THE Haworth Urban District Council are prepared to receive TENDERS for the Purchase of their Surplus TAR and LIQUOR for the year ending March 31, 1921.
Tenders to be sent to me, endorsed "Tender for Tar and Liquor," not later than Feb. 21, 1920.
WILLIAM ROBERTSHAW, Clerk.
Barclay's Bank Chambers, North Street, Keighley.

CITY OF BELFAST.

THE Gas Committee of the Belfast Corporation invite TENDERS for the Supply, Delivery, and Erection of FOUR WATER-COOLED CONDENSERS at the Gas-Works.
Specification and Drawing may be obtained from Mr. J. D. Smith, Engineer and Manager.
Tenders, endorsed "Tender for Condensers," should be lodged in the Office of the Undersigned not later than the 19th of February, 1920.
A Tender, if sent by post, must be Registered; if delivered by hand, an Official Receipt must be obtained for it, otherwise the Undersigned will not be responsible.
The lowest or any Tender not necessarily accepted.
R. MEYER, Town Clerk.

COMPANY NOTICE.

HORNSEY GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at No. 5, Great Winchester Street, in the County of London, on Friday, the 27th day of February, 1920, at Twelve o'clock (noon) precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 31st of December last; to declare Dividends; elect Two Directors and an Auditor; and to transact the Business of an Ordinary General Meeting.
The TRANSFER BOOKS WILL BE CLOSED from the 13th to the 27th of February, 1920, both days inclusive.
By order of the Board,
WILLIAM E. ROBERTS, Secretary.
Secretary's Office: Gas-Works, Clarendon Road, Hornsey, N. 8, Feb. 7, 1920.

Royal 8vo., Cloth, Gilt Lettered, Price 15s. net.
Clauses and Precedents in
ELECTRICITY, GAS, & WATER LEGISLATION.
Being a Comparison of the Provisions contained in the Model Bills, in Special and Municipal Acts, and in Provisional Orders, 1910 to 1914, relating to these Public Services.
Compiled and noted by
JACQUES ABADY,
of the Middle Temple, Barrister-at-Law.
London: WALTER KING, "JOURNAL" OFFICES, 11, BOLT COURT, FLEET STREET, E.C. 4.

SAVE MONEY
BY DRIVING YOUR AUXILIARY PLANT ELECTRICALLY
I have special experience in this work, and my services are at your disposal.
W. T. WARDALE, A.M.Inst.E.E. 13, The Drive, Marloliffe Road, SHEFFIELD.

TROTTER, HAINES, & CORBETT, LIMITED.
BRETTELL'S ESTATE,
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every Description of FIRE BRICKS. Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
LONDON OFFICE: E. C. BROWN & CO., LEADENHALL CHAMBERS, 4, ST. MARY AXE, E.C.

CARBURINE & BENZOL FOR GAS ENRICHING
ALSO
THE MAXIM PATENT CARBURETTOR.
For Prices, &c., apply to
The GAS LIGHTING IMPROVEMENT CO., Ltd.
SALISBURY HOUSE, LONDON WALL, E.C.
Telephones: 4451, 4452, 4453, and 4454 London Wall.
Telegraphic Address: "Carburine, London."

HIGH-PRESSURE DISTRIBUTION
GAS DISTRIBUTION LIMITED
(Late HELM LAMP COMPANY)
can supply
Everything except the Gas.
WELDED JOINTS ARE OUR SPECIALITY.
Queen's Buildings, NUNEATON.

JOHN HALL & CO. OF STOURBRIDGE LIMITED,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods
RETORTS CAREFULLY PACKED FOR SHIPMENT.

TELEPHOS
NO BY-PASS
COMPLETE SETS
FROM 11/6 SUBJECT.
NEW 1914 MODELS
Apply for New Catalogue to:—
"TELEPHOS"
16/20, Farringdon Avenue, E.C.
BRITISH MADE.
GAS SWITCH

Price 21s. net. Post free in the United Kingdom.
THE EIGHTH EDITION OF
Newbigging's Handbook
FOR
Gas Engineers and Managers.
LONDON: WALTER KING, "GAS JOURNAL" OFFICE, 11, BOLT COURT, FLEET STREET, E.C. 4.

ROTARY METERS
are built in units of hourly capacities from
1000 cu. ft. to 1,000,000 cu. ft.
for COAL GAS, COKE OVEN GAS, AIR, &c.
ONE TENTH THE SPACE, ONE HALF THE COST OF "OLD STYLE" WET METER.
T. Q. MARSH. ROTARY METER CO. (1905) LTD., WHITEFIELD . . MANCHESTER.